for . . .

engineers and contractors controlling the design, specification, installation and maintenance of heating, ventilating and air conditioning.

HEATING & VENTILATING

AIR CONDITIONING

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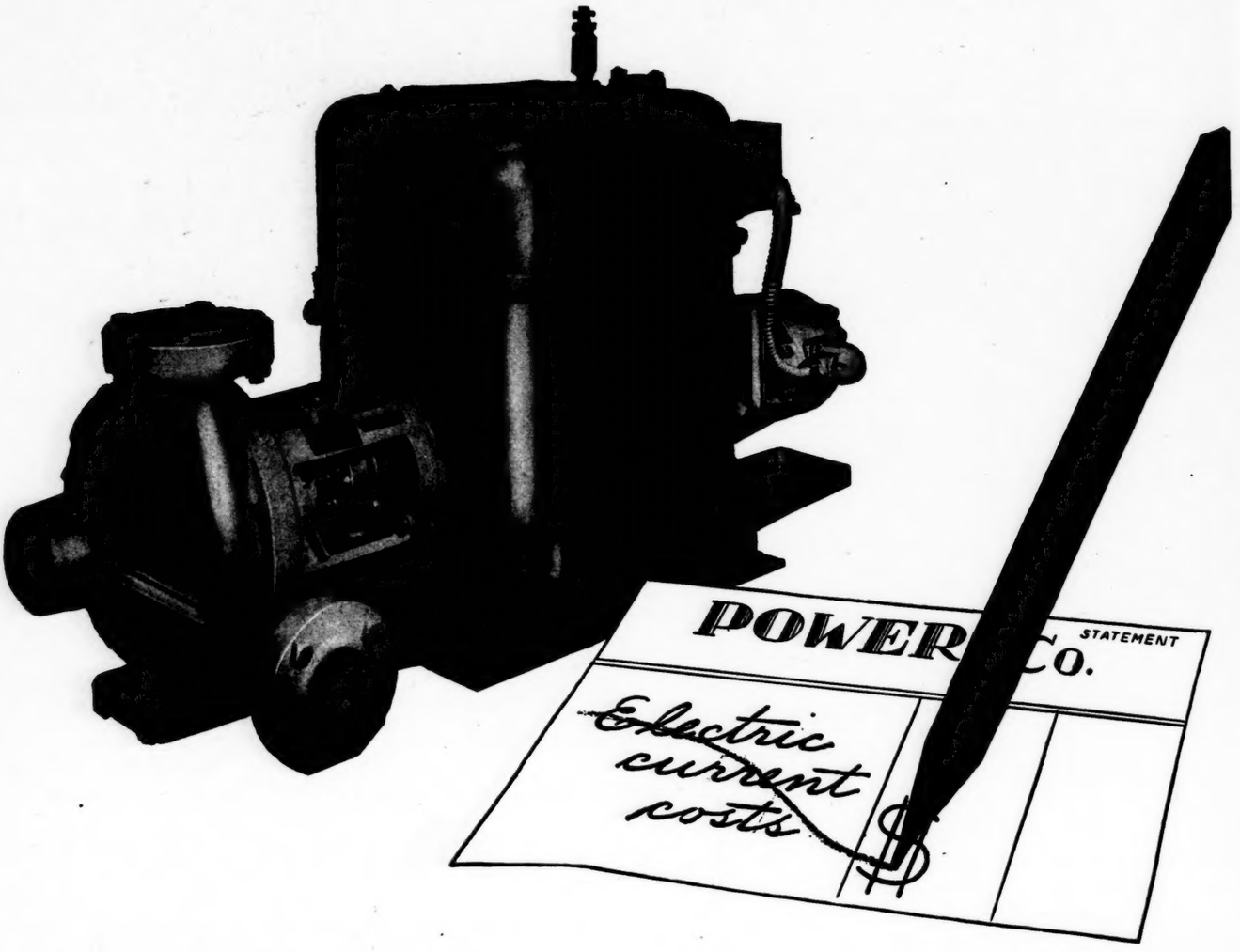
A NASH VAPOR TURBINE HEATING PUMP WILL ELIMINATE THIS EXPENSE ITEM.



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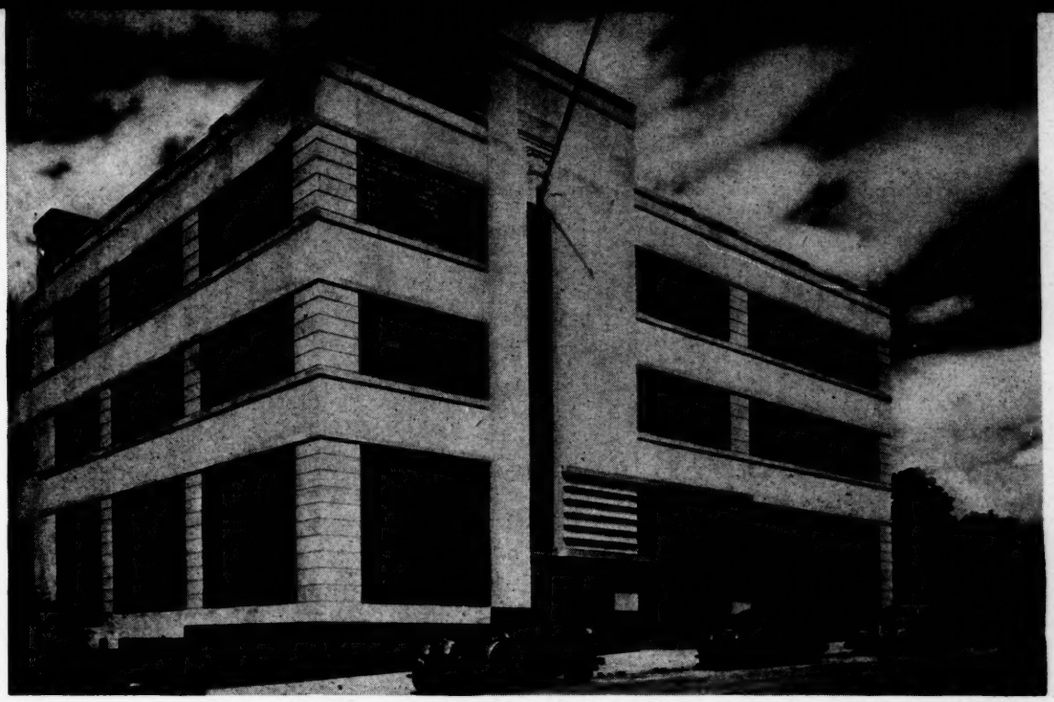


Asheville Citizen Times Building, Asheville, N. C.

Unique System Conditions

Asheville Radio and Newspaper Building

By S. C. MINNICH, JR.†

One measure of how well a heating or air conditioning installation is designed is its ability to take care of rooms of a varied occupancy while taking full advantage of local conditions. Here is an example of a new and modern building where latest practices have been incorporated. Five separate systems of heat supply serve such spaces as composing rooms, press rooms, editorial and clerical offices, and a radio broadcasting station. Winter air-conditioning, year-round air conditioning, a system of direct radiation and zoning are all present. Distinctive also is the ingenious method used to take advantage of Asheville's low temperature night air for cooling in summer in important parts of the building.

THE Asheville Citizen-Times Corporation of Asheville, North Carolina, owns and operates the two local newspapers, *The Asheville Citizen* and *The Asheville Times*, in addition to the radio station WWNC. Until early in 1938, the newspapers and radio broadcasting station occupied separate buildings. Continued growth and expansion resulted in the owners' energetic and progressive decision to construct a new plant incorporating all the requirements pertaining to an enterprise of this nature, and they were determined that the structure should combine contemporary advancement in building design and the use of only the most modern mechanical equipment which, they felt, would be in keeping with their past progress.

The building throughout is constructed with fireproof material, all structural members being reinforced concrete while the curtain walls are made of glass brick. The owners insisted upon the use of windows, consequently steel sash are used throughout the entire plant and these are single glazed. The spandral beams and columns are faced with limestone. The building was made practically air tight, and its insulating qualities are excellent.

Five Supply Systems Used

As there is no outside source from which steam might be procured, it was decided to install two low-pressure boilers each one being capable of supplying the maximum heat requirements for the building independently of the other. Each of these boilers is equipped with automatically controlled stokers, and the various systems are designed to use two-pound steam.

One of the most important problems to be met in designing the heating, humidifying, ventilating, and air conditioning systems was that the building must be utilized for two distinct purposes. One two story section of the building was to be used for production purposes, and this portion houses the machinery for the composing room, press room, and mailing room. The other portion of the building which was three stories in

†Formerly of the office of Anthony Lord, architect. Now with The Powers Regulator Company, Greensboro, North Carolina, Office.

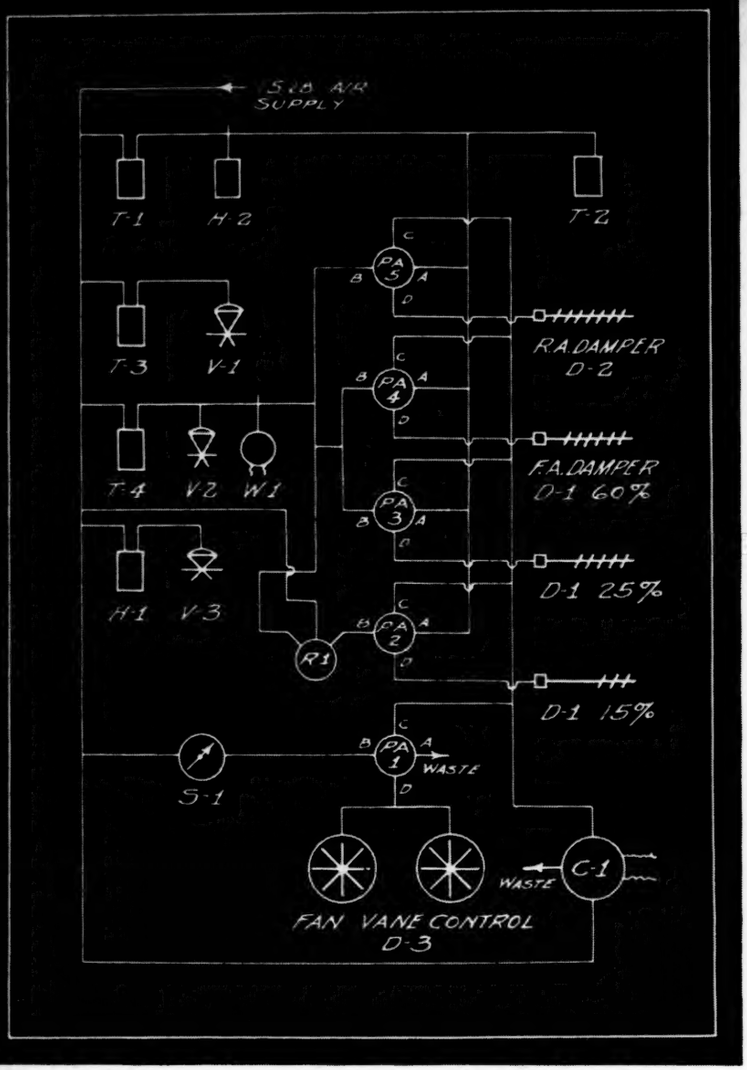


Fig. 1. Control arrangement in editorial and clerical portion of building including automatic use of night air.

height was to be used for clerical and editorial purposes, and the radio studios were to be located on the third floor. The two divisions were treated as separate buildings to the extent that cork insulation separated the concrete girders and columns in such a manner as to eliminate in so far as possible any sounds or vibrations being transmitted from the production area to the clerical and editorial spaces. Inasmuch as every structural consideration was employed to accomplish the best results for eliminating undesirable sounds and vibrations which might be carried to the radio studios, it was determined best to locate the ventilating and air conditioning equipment for the clerical spaces and radio studios on the roof of the production portion of the building housing the machinery. This was done with the exception of the heating and ventilating equipment for the first floor clerical space which is located in the basement. Another problem governing the design of the systems and the one which determined that each floor in the clerical and editorial spaces should have a separate and distinct heating and ventilating system was that these various floors would be occupied at different hours throughout a twenty-four hour day. This unusual occupancy was imperative inasmuch as separate editorial offices were necessary for the operation of a morning and evening paper. Thus in the clerical portion of the building three separate heating, humidifying, and ventilating systems are installed, as well as a complete year around air conditioning system for the radio studios. In the production portion housing the machinery, one central heating, humidifying, and ventilating system was designed to serve the composing and mailing rooms.

In addition to these supply air systems it was necessary to consider exhaust air systems for all toilets and wash rooms as well as for the etching, engraving, and stereotype areas.

Composing Room

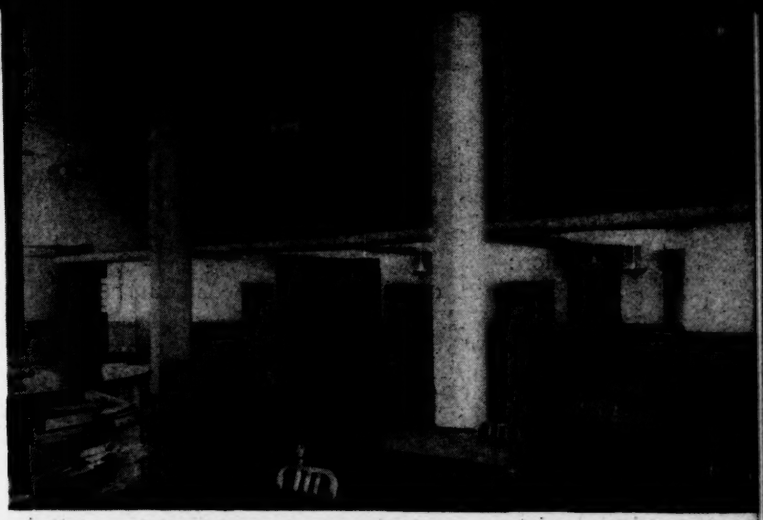
The composing room, housing the linotype machines is located directly above the press room and has its own heating and ventilating systems with provision for winter humidification. Both fresh and return air are filtered. A separate exhaust air system was originally considered for the lead melting pots on the linotype machines, but this idea was abandoned; however, this feature could easily be added if conditions should ever warrant such an expenditure. The capacity of this system is 26,000 c.f.m. which is sufficient to supply a two-minute air change, and the heaters are designed to allow this air change in winter using 50% outside air at 0F. By using this maximum air capacity it would be possible to rapidly flush this area should a concentration of lead fumes ever occur. Varying the fan capacity is accomplished by vane dampers on the fan controlled by a gradual acting pneumatic summer-winter switch, which has a dial calibrated in c.f.m.

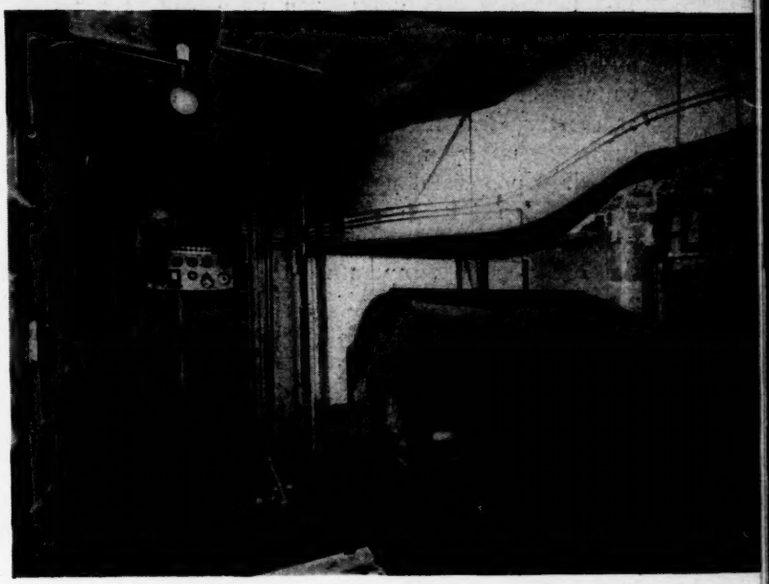
Radiators for Press Room

No humidifying or ventilating system is used in the press room, the heat loss being taken care of by the use of direct radiation. Due to the style printing press being used it was deemed advisable not to have any perceptible air movement in this area since a fine mist of ink is emitted from the equipment. Should it ever be found necessary to install any type of forced ventilation in this area, it would be a simple matter to procure a source of filtered supply air by diverting air now being exhausted from the composing room.

Editorial Spaces Zoned

Each of the three principal heating, humidifying, and ventilating systems supplying the three floors for the clerical and editorial space is similar; consequently, a description of one will apply equally well to the other two. All air, both fresh and return, is filtered and this mixture is passed through pre-heaters capable of raising the temperature of the mixture to 70F D.B. with 25% fresh air at 0F outside temperature. When this 70F air leaves the fan it passes through zone booster heaters, located at the plenum chamber, from where it is distributed through supply air ducts to the various zones. The first floor system with a maximum capacity of 28,000 c.f.m. is divided into three zones; the second floor system with a maximum capacity of 16,000 c.f.m. is divided into five zones, and the third floor system





(Above) Clerical space on first floor. Note side wall grilles for air supply. (Below) Fan room for supplying clerical space on second floor. Maximum fan capacity is 16,000 c.f.m.

with a maximum capacity of 12,000 c.f.m. is divided into four zones. This zoning accomplishes the most even distribution of heat for the various exposures. Should the owners ever wish to install complete year around air conditioning in this area, no changes would have to be made in any of the air distribution systems.

To afford proper winter humidification fin tube evaporator type humidifiers are used, these being located directly after the pre-heaters. A variation in the air quantities for summer and winter requirements is obtained through vane dampers on the fan inlets which are controlled by a gradual acting pneumatic summer-winter switch calibrated in c.f.m. Approximately one-third the amount of air is used in winter as compared with that required for summer operation. This difference in the quantities of air handled introduced a distinct problem in the selection of grilles inasmuch as a noise level exceeding 35 decibels is undesirable when the maximum quantity of air is being handled. When the minimum amount of air is introduced, the most important factor is to obtain the proper air diffusion with this decreased velocity. Satisfactory results are accomplished by selecting grilles which give the desired air diffusion when using the minimum amount of air and then checking this grille selection for its noise level when delivering the maximum amount of air.

All exhaust air is used whenever possible before being eliminated through gravity spill louvers. The air from the first floor system is first spilled to the paper storage area of the basement before being exhausted. Spill air from the second floor unit is exhausted into the composing room and from there to the outside through gravity louvers, located in the skylight. These gravity louvers also are sized to handle the exhaust air from the composing room heating and ventilating system. Spill air from the third floor system is used to assure positive circulation in the furred attic space before reaching the outside.

Much thought and deliberation was given to the idea of using direct radiation in conjunction with these forced air heating and ventilating systems, but it was finally decided that satisfactory results could be obtained without this additional expenditure; consequently, the use of any direct radiation in these areas was abandoned.

Both the adequacy and performance of the systems as designed were verified during the past winter, which was one of the severest on record, inasmuch as an even distribution of heat was obtained throughout the entire area served by these systems, without objectionable drafts.

Night Air Used Automatically

Everyone reading this article is undoubtedly familiar with the fact that Asheville is endowed with an excellent summer climate, and this fact is particularly true when applied to the nights during this season of the year since the average night temperature is 60F dry bulb, and very often 55F dry bulb. Since nature had been so generous in this respect, it was decided to take advantage of this cool night air and use it as an integral part of the three main systems to afford additional comfort throughout a greater portion of the following day. This was accomplished in a unique manner by introducing this night air into the building and recirculating it in accordance with a pre-determined schedule which was automatically controlled by separate electric clocks and thermostats for each system. In the event the outside relative humidity should become too high, the outside air dampers are automatically closed through the action of separate *hygroscopic wastes* which allow the air in the building to be recirculated until the outside condition again warrants the introduction of more outside air. Since the curtain walls of the building are glass brick, excellent insulating qualities were afforded, and by using venetian blinds to lessen the radiated heat from this source as well as from the windows in the glass brick walls, it is possible to maintain a favorable inside-outside temperature differential during a greater portion of the day. The means of obtaining this temperature differential has proven to be the most desirable and unique feature of the heating, humidifying, and ventilating systems.

Control for Editorial Spaces

The automatic temperature and humidity control system is of the pneumatic type, and a separate control

panel is located in the equipment room of each unit. The control system for each of the three main units is shown in Fig. 1 and is explained in the following description:

During winter operation when the plenum temperature is below 67F, thermostat T-4 located in the plenum allows steam valve V-2 on the pre-heaters to be open and fresh air damper D-1 to be closed while return air damper D-2 is open. As the temperature rises to 67F the 15% portion of fresh air damper D-1 opens positively through the action of relay R-1, and as the temperature continues to rise the 25% portion of damper D-1 begins to gradually open until 70F is reached, whereupon the 60% portion of damper D-1 is gradually opening, damper D-2 is gradually closing, and the valve V-2 has closed during this temperature range, and as the temperature continues to rise damper D-1 assumes a full open position while D-2 is completely closed. Upon a falling temperature this cycle is reversed. Zoned room thermostats T-3 actuate steam valves V-1 on the various booster heaters so as to raise the 70F plenum temperature to whatever peak temperature may be required for the different zones. The gradual summer-winter switch S-1 is positioned to winter setting and has the fan vane control D-3 positioned to approximately one-third the total fan capacity. The hygrostat H-1, located in the plenum, controls the steam valve V-3 in the steam header to the evaporator humidifier. Valve W-1 is of the magnetic type and is wired into the supply fan circuit so that in case of a power failure air can be bled, thus allowing dampers D-1 and D-2 to assume their normal positions until the supply fan again starts, whereupon the normal cycle of operation is resumed.

In summer, zone room thermostats T-3 are inoperative and plenum thermostat T-4 controls dampers D-1 and D-2. Switch S-1 is positioned to summer setting and permits vane control D-3 to be completely open.

The summer night control cycle is unique in that it functions in such a manner that at a pre-determined time the electric clock C-1 automatically transfers, through pilot valves PA-2, PA-3, PA-4, and PA-5, the control of dampers D-1 and D-2 from thermostat T-4 to thermostats T-1 and T-2. Thermostat T-1 set at 55F is located in the outside air intake, and T-2 set at 70F is located in the exhaust air stream. So long as the outside air does not go below 55F or the exhaust air does not exceed 70F, the outside air dampers D-1 will be open and return air damper D-2 will be closed, otherwise, they will assume opposite positions. To prevent undue moist air being introduced during this cycle a *hygroscopic waste* H-2 bleeds the air supply to dampers D-1 and D-2, thus allowing no more outside air to be introduced until the outside relative humidity again rises above the setting of H-2. This operation continues until the clock C-1 again automatically transfers the control back to thermostat T-4 for day operation.

Broadcasting Station is Mechanically Cooled

The only portion of the building mechanically cooled is the radio broadcasting station WWNC located on the third and top floor of the clerical portion of the building. The spaces which surround the studios are served by the third floor heating, humidifying and ventilating system.

The radio station itself consists of three broadcasting studios with their separate viewing rooms, a transcription room and a control room. All of these are interior rooms, and due to this fact as well as to the excellent manner in which they are insulated for both heat and sound, the cooling load is predominantly a latent heat problem.

The air conditioning system for these studios is designed as a complete and separate unit, with both supply and return air duct systems. The supply fan serving this system operates at a constant speed and volume and has a delivery of 2,400 c.f.m. Both supply and return air are mixed in a common plenum chamber and this mixture is drawn through a preheater and air filters before entering the supply fan. Through an arrangement of zone mixing dampers the discharge air either enters or by-passes a direct expansion cooling coil before being discharged to the three zones. These mixing dampers are under the control of separate zone thermostats located in the three studios. The fourth zone, which serves the control room, uses only cool air both summer and winter since enough heat is generated by the electrical equipment to require cooling at all times. This is the only area in which a varying air volume is used, and this is accomplished by a room zone thermostat which controls a volume damper in the supply duct to this room.

Cooling is accomplished through the use of a direct expansion coil with F12 used as the refrigerant. The compressor has a capacity of 7½ tons refrigeration and is equipped with a two-speed motor which makes it possible to reduce the initial capacity 50%. When two or more zones call for cooling simultaneously, the compressor is controlled to run at the higher speed; otherwise it operates at the lower speed. This capacity reduction is automatically accomplished through the zone thermostats which actuate electric pressure switches wired into the compressor motor circuit. In conjunction with the compressor an evaporative condenser is installed on the roof directly outside the equipment room.

The system is designed to maintain an interior summer condition of 75F D.B. and 50% R.H. when the outside condition is 95F D.B. and 75F W.B. In winter the inside condition is to be 75F D.B. and 50% R.H. when the outside temperature is 0F.

Now that the owners have occupied the building for more than a year, ample time has elapsed to indicate that the systems as designed have proven satisfactory inasmuch as they have operated under all conditions.

These systems were designed by the writer of this article. The architect for the building was Mr. Anthony Lord, of Asheville, North Carolina, and the heating equipment was installed by the W. H. Arthur Company, also of Asheville.

Estimating Heat Flow Through Sunlit Walls

PART 3—PRACTICAL APPLICATIONS

By C. O. MACKEY† and L. T. WRIGHT, JR.‡

The problem of finding a rational method of determining the cooling load as affected by solar radiation on building surfaces is a very important one. Tables have been available for some time giving the instantaneous cooling load due to the transmission of solar radiation by window glass. Heretofore there has been no published method whereby the effect upon the cooling load of sunlit walls and roofs could be obtained. The authors of this article have developed such a method. It is being published in three parts in HEATING & VENTILATING.

In two preceding installments the authors have presented a method whereby calculations can be made for walls of one material and for composite constructions.

In this installment they present tables which may be readily and simply applied to practical problems involving typical constructions.

THE authors have followed the scheme of calculation outlined in the preceding installment for some walls and roofs with the results shown in Tables 8A, 8B, and 8C. In these tables, the combined effect of air temperature and incident solar energy is given in terms of an equivalent total temperature difference; this temperature difference multiplied by the overall coefficient of heat transfer gives the actual rate of heat transfer to the indoor air. Strictly, the overall coefficient of heat transfer should be based upon a value of 4 B.t.u. per hr. sq. ft. deg. F for the outside air film coefficient, but if the overall coefficients given in the HEATING & VENTILATING Reference Data—79 are used, the calculated cooling load will be on the safe side, since these values are based upon an outdoor air film coefficient of heat transfer of 6.

Table 8 was calculated for a North latitude of 40°. The effect of latitude, for any city in the United States, is slight and probably less than 3%. If the hourly variation of outdoor design dry-bulb temperature is different from that assumed in Fig. 1b, the equivalent temperature differentials are affected. An indoor dry-bulb temperature of the air of 80F was assumed. If another indoor air temperature, t′, is used, add (80 — t′) to the temperature differentials given in Table 8. This table, with its rational basis, should give with fair accuracy the contribution of air temperature difference and sun effect to the cooling load at any hour of the design day.

As an example of the use of Table 8 in a practical case, consider a typical problem.

Example 1—What is the hourly total load due to solar and air temperature effect on the top floor of an air-conditioned building which has 12″ brick walls with plaster finish on the inside and a flat roof composed of 4″ of concrete, 2″ of insulation, aluminum colored roofing paper, and a plastered ceiling? The various wall, glass, and roof areas are shown in Table 6.

†Professor of Heat-Power Engineering, Cornell University.
‡Graduate Student in Mechanical Engineering, Cornell University.

TABLE 6.—SURFACE AREAS IN EXAMPLE

Area	Total Wall Area, Sq. Ft.	Glass Area, Sq. Ft.	Net Wall Area, Sq. Ft.	Roof Area, Sq. Ft.
North Wall..	1500	300	1200	
East Wall...	1000	150	850	
South Wall..	1500	300	1200	
West Wall...	1000	150	850	
Roof.....	....	...	...	15,000

The windows are equipped with light-colored venetian blinds which permit only 60% as much radiant energy transmission through the glass as do bare windows.

SOLUTION:—From H & V's Reference Data—79, the overall transfer coefficients for the walls and roof are U = 0.34 for the walls (No. 7B in Data), and U = 0.12 for the roof (No. 112E in Data).

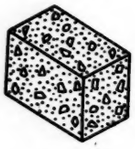
The problem of finding the part of the cooling load due to the air temperature difference and the solar radiation may be solved in tabular form as in Table 7.

TABLE 7.—HOURLY TOTAL LOAD DUE TO SOLAR AND AIR TEMPERATURE EFFECT ON BUILDING IN EXAMPLE 1

	Glass* (See Below) B.t.u. Per Hr.				Wall								Roof		Total Load Solar and Air Temp.
					Δt From Table 8A °F				q = UA Δt B.t.u. Per Hr.				Δt From Table 8C, °F	q = UA Δt	
Time	North	East	South	West	North	East	South	West	North	East	South	West		B.t.u. Per Hr.	B.t.u. Per Hr.
8 A.M.....	1,000	16,400	1,000	500	7	11	10	13	2,900	3,100	4,100	3,800	6	10,800	43,600
10 A.M.....	2,500	9,400	8,100	1,300	8	11	10	13	3,300	3,100	4,100	3,800	12	21,600	57,200
12 A.M.....	4,100	2,000	12,100	2,000	9	13	11	13	3,700	3,800	4,500	3,800	20	36,000	72,000
2 P.M.....	5,000	2,500	8,100	9,400	9	16	12	13	3,700	4,600	4,900	3,800	26	46,800	88,800
4 P.M.....	5,000	2,500	5,000	16,400	9	18	12	13	3,700	5,200	4,900	3,800	28	50,400	96,900
6 P.M.....	4,400	2,200	4,400	6,300	9	18	13	13	3,700	5,200	5,300	3,800	27	48,600	83,900
8 P.M.....	3,600	1,800	3,600	1,800	8	16	14	14	3,300	4,600	5,700	4,000	23	41,400	69,800
10 P.M.....	2,500	1,300	2,500	1,300	7	14	13	15	2,900	4,000	5,300	4,300	19	34,200	58,300
12 P.M.....	1,500	800	1,500	800	6	13	11	16	2,400	3,800	4,500	4,600	14	25,200	45,100

*The load due to the glass area is found in two parts as follows:
(1) When there is solar radiation incident on the glass
$q = AQ$
where Q is the amount of radiation incident on a square foot of the glass as found in various standard tables
(2) When no solar radiation is incident on the glass
$q = UA (t_a - 80)$
where t_a is the outdoor air temperature

ESTIMATING HEAT FLOW THROUGH SUNLIT WALLS

WALLS OF ONE MATERIAL		CONSTRUCTION NO. (ON H. & V.'S REFERENCE DATA SHEET 71 OR 79)	WALL THICKNESS	FACING	HOURS OF DAY: 8 AM	10	12 NOON	2 PM	4	6	8	10	12
					WHEN TEMPERATURE DIFFERENCE GIVEN BELOW IS MULTIPLIED BY THE OVERALL COEFFICIENT, U, THE PRODUCT IS THE ACTUAL RATE OF HEAT FLOW TO INDOOR AIR, IN B.T.U. PER HR. SQ. FT.								
PLAIN BRICK MASONRY WALLS	NO PLASTER ON WALLS	1A	4"	N*	2	4	7	10	12	13	13	11	9
				E	20	29	29	27	25	23	19	15	11
				S	3	8	16	22	24	23	20	17	13
				W	4	5	10	20	33	39	34	28	22
		2A	8"	N*	5	4	4	5	7	9	10	11	10
				E	8	11	16	19	19	18	17	16	15
				S	7	6	7	10	15	17	17	17	15
				W	9	7	6	7	11	18	23	24	21
		3A	12"	N*	7	8	9	9	9	9	8	7	6
				E	11	11	13	16	18	18	16	14	13
				S	10	10	11	12	12	13	14	13	11
				W	13	13	13	13	13	13	14	15	16
STONE WALLS	WALLS ARE WITHOUT PLASTER	9A	8"	N*	4	4	4	6	8	10	11	11	11
				E	9	13	17	17	17	17	16	15	13
				S	5	5	7	11	15	16	16	15	14
				W	7	6	5	8	13	19	23	21	19
		10A	12"	N*	7	6	5	5	6	7	8	9	10
				E	9	9	10	12	13	14	14	13	13
				S	9	8	8	7	9	11	13	13	14
				W	11	9	8	7	8	10	14	17	17
CONCRETE  WALLS	PLAIN WALLS; NO PLASTER		2"	N*	4	9	12	15	15	14	11	8	4
				E	28	33	32	30	30	21	16	10	5
				S	9	18	24	26	24	20	16	11	6
				W	4	10	21	35	40	38	28	21	14
			4"	N*	3	6	9	14	14	14	12	10	7
				E	23	26	26	27	23	20	16	12	8
				S	4	11	19	24	23	20	17	13	9
				W	4	7	14	28	35	35	29	23	16
		13A	8"	N*	2	3	6	8	11	12	12	12	10
				E	11	18	20	21	20	19	17	15	11
				S	3	5	11	16	19	19	18	15	13
				W	5	5	7	14	23	28	27	23	19
			12"	N*	5	4	4	5	7	9	11	11	10
				E	7	10	14	16	16	16	16	15	13
				S	6	5	6	10	14	16	16	15	14
				W	7	6	5	7	12	18	22	21	19
		15A	16"	N*	7	6	5	5	6	7	9	10	10
				E	9	8	10	13	14	14	14	14	14
				S	8	7	7	8	10	12	13	14	14
				W	10	9	9	7	8	11	15	18	17
		16A	20"	N*	8	7	6	6	5	6	7	8	8
				E	11	10	10	12	12	13	13	13	13
				S	10	9	8	8	8	9	10	12	12
				W	13	12	11	10	9	10	11	14	16

* USE ALSO FOR SHADE

Table 8A—Equivalent total temperature differences due to sun and air for walls of one material.

ESTIMATING HEAT FLOW THROUGH SUNLIT WALLS

WOOD FRAME WALLS		CONSTRUCTION NO. (ON H. & V.'s REFERENCE DATA SHEET 73 OR 79)	PAINT	FACING	HOURS OF DAY: 8 AM	10	12 NOON	2 PM	4	6	8	10	12
					WHEN TEMPERATURE DIFFERENCE GIVEN BELOW IS MULTIPLIED BY THE OVERALL COEFFICIENT, U, THE PRODUCT IS THE ACTUAL RATE OF HEAT FLOW TO INDOOR AIR, IN B.T.U. PER HR. SQ. FT.								
WOOD SIDING 25/32" WOOD SHEATHING PLASTER ON STUDDING NO INSULATION		41 B		N*	4	8	12	14	15	14	11	8	4
			LIGHT	E	24	26	26	25	22	19	14	9	4
				S	7	15	21	23	22	19	15	10	6
				W	4	9	18	30	35	31	25	18	12
			DARK	E	39	39	36	33	28	22	16	10	4
				S	10	20	29	30	27	23	18	12	7
				W	4	10	24	42	50	44	35	26	17
WOOD SIDING 25/32" WOOD SHEATHING PLASTER ON STUDDING ROCK WOOL FILL		41 H		N*	0	4	8	11	13	13	12	10	7
			LIGHT	E	15	20	21	22	21	19	16	12	8
				S	1	8	15	19	20	19	16	13	9
				W	1	5	11	20	28	29	25	20	15
			DARK	E	25	32	31	29	27	23	18	14	8
				S	2	10	20	25	25	23	19	15	10
				W	2	5	13	27	39	41	35	28	20
WOOD SIDING 25/32" RIGID INSULATION FOR SHEATHING PLASTER ON STUDDING		42 B		N*	3	7	11	14	15	14	11	9	5
			LIGHT	E	22	24	25	24	22	19	15	10	5
				S	6	14	20	22	22	19	15	11	6
				W	3	8	17	28	34	31	25	19	13
			DARK	E	35	37	35	32	28	23	17	11	5
				S	8	19	27	29	27	23	18	13	7
				W	4	9	21	39	48	44	36	27	18
BRICK VENEER 25/32" WOOD SHEATHING PLASTER		50 B		N*	3	3	5	8	10	12	12	12	10
				E	14	23	26	25	24	22	19	16	12
				S	3	6	12	19	22	21	20	17	14
				W	6	5	7	15	26	34	33	28	23
BRICK VENEER 25/32" WOOD SHEATHING PLASTER ON STUDDING ROCK WOOL FILL		50 H		N*	4	4	4	6	8	10	11	11	11
				E	8	14	20	21	20	19	18	16	14
				S	5	5	7	12	17	19	19	17	15
				W	8	7	6	9	16	24	28	26	22
BRICK VENEER 25/32" RIGID INSULATION FOR SHEATHING PLASTER		51 B		N*	3	3	5	7	10	11	12	12	10
				E	12	21	24	24	23	21	19	17	13
				S	4	5	10	17	21	21	20	18	14
				W	6	5	7	13	23	31	31	29	23
* USE ALSO FOR SHADE													

Table 8B—Equivalent total temperature differences due to sun and air for wood frame walls.

ESTIMATING HEAT FLOW THROUGH SUNLIT ROOFS

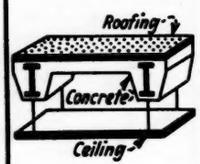
FLAT ROOFS						HOURS OF DAY								
	COLOR OF ROOFING	CONSTRUCTION NO. (ON H. & V.'S REFERENCE DATA SHEET NO. 77 & 79)	THICKNESS OF ROOF DECK	INSULATION	PLASTER CEILING	8 AM	10	12 NOON	2 PM	4	6	8	10	12
						WHEN TEMPERATURE DIFFERENCE GIVEN BELOW IS MULTIPLIED BY THE OVERALL COEFFICIENT, U, THE PRODUCT IS THE ACTUAL RATE OF HEAT FLOW TO INDOOR AIR, IN B.T.U. PER HR. SQ. FT.								
CONCRETE  ROOFS	BLACK	100 A	2"	0	NO	39	63	76	74	62	47	33	20	10
		101 A	4"	0	NO	23	46	64	72	65	52	39	27	17
		102 A	6"	0	NO	15	32	52	64	63	54	43	32	22
		101 E	4"	2"	NO	14	29	48	61	62	55	44	33	24
		102 E	6"	2"	NO	12	25	43	57	60	55	45	35	25
		112 E	4"	2"	YES	13	28	46	59	62	55	44	34	24
		113 E	6"	2"	YES	12	24	41	55	60	55	46	35	26
	ALUMINUM	100 A	2"	0	NO	16	27	34	35	31	25	19	12	7
		101 A	4"	0	NO	11	21	29	35	33	28	23	18	12
		102 A	6"	0	NO	7	13	22	28	29	27	23	18	13
		101 E	4"	2"	NO	6	12	20	27	29	27	23	19	14
		102 E	6"	2"	YES	6	11	18	25	28	27	23	19	15
		112 E	4"	2"	YES	6	12	20	26	28	27	23	19	14
		113 E	6"	2"	YES	6	10	18	24	27	27	23	19	15
WOOD ROOFS	BLACK	104 A	1½"	0	NO	23	45	63	70	64	52	39	27	17
		104 E	1½"	2"	NO	11	22	39	53	59	55	46	36	27
		115 E	1½"	0	YES	11	21	38	53	58	55	46	37	25
	ALUMINUM	104 A	1½"	0	NO	9	19	27	31	31	27	21	16	10
		104 E	1½"	2"	NO	6	9	16	23	27	26	24	20	16
		115 E	1½"	2"	YES	6	9	16	23	26	26	24	20	15

Table 8C—Equivalent total temperature differences due to sun and air for flat roofs.

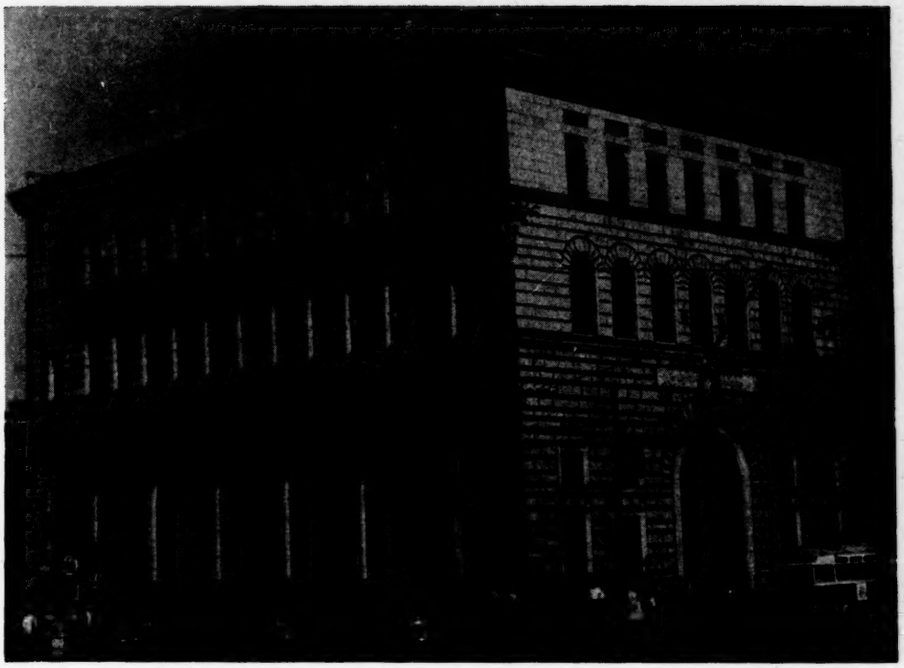


Fig. 1. Main office building, Camden Trust Company, Camden, N. J.

Bank Modernizes Old Ventilating System into Complete Air Conditioning Plant

By CHARLES W. COWARD†

The Camden Trust Company re-arranges four old fan systems, installs well water cooling system and, utilizing many old air inlet openings, now has a modern comfort air conditioning system, one of the largest in South Jersey.

THE Camden Trust Company, in accord with its long established policy of providing the utmost in convenience and comfort for patrons and employees, has just completed the installation of one of the largest comfort air conditioning plants in Southern New Jersey. This makes the company's four-story main office building at Broadway and Market Street, in Camden, the first large office building in this area to be entirely conditioned for summer comfort.

During the progress of the initial survey, several interesting problems of design were encountered by the engineers. The building was found to have an existing ventilating system, which had been abandoned due to unsatisfactory air distribution and an excessive cost of operation. The owners were desirous of placing this ventilating system in condition for economical usage, so a basis was at hand for the air distribution system.

Further investigation proved that a large portion of four existing fan systems could be utilized, in part at least, and by stepping up the horsepower of the existing fans sufficient air volume could be handled. The direction of air flow was reversed in numerous instances and new duct work installed to provide additional outlets and proper recirculation.

Selection of refrigerating equipment entailed considerable study. Floor space was found to be at a minimum, practically eliminating the idea of using direct expansion. The cost of power and water was also found to be a factor in loading up operating costs beyond economical limits.

Preliminary calculations involved a cooling load of 105 tons under standard design conditions, with a minimum ratio of 9 to 1 between sensible and latent heat gains. This condition opened up the possibility of using well water. As a plentiful supply of low temperature water was found to be available in the area a 16 in. well was driven through the boiler room floor to a depth of 130 ft. A pump mounted on the well head, powered with a 30 hp. electric motor delivered 400 g.p.m. at 75 lb. gauge pressure at the pump outlet.

With this installation, a cooling medium was secured at approximately one-third the operating cost of equivalent capacity of direct expansion equipment.

Since the existing fans and filters of the old ventilating system were located in an attic space, chilled water

†Consulting Engineer, Camden, N. J.

from the well is piped to the vicinity of these fans and distributed to copper fin cooling coils mounted in the existing duct system, discharged water being conducted to the street sewer system.

The original ventilating system consisted of four separate supply units and one exhaust unit. Exhaust air was drawn from numerous toilet and wash rooms. This arrangement afforded unusual facilities for zoning since loads varied greatly in different areas. The exhaust system was utilized for disposing of a portion of the waste air, replaced by fresh air introduced, amounting to 15 c.f.m. per occupant, and the balance of the waste air discharged into the boiler room to provide air necessary for boiler combustion.

Cooling coils for each system are divided into two sections; the first section handles outside air only and is designed to cool the incoming air to 63F dry bulb and 62½F wet bulb under maximum standard design conditions. Cooled fresh air is mixed with recirculated air in an intermediate chamber and passes through the mixed air cooling coils, where its temperature is dropped to 60F dry bulb and 59.25F wet bulb.

This latter condition of the air supply is the minimum design temperature condition. However, the water supply to the mixed air cooling coil is controlled by room thermostats and humidistats actuating three-way water supply valves, thus maintaining effective temperature in conditioned areas of 74F by modulation of water passing through coils.

Additional control of conditioned areas is obtained by zoning the East and West exposures in each system, the mixed air coils being split accordingly and installed in the respective trunk ducts, each being controlled by its separate room thermostat.

Cooling coils are constructed on the counter flow principle, thus subjecting the coolest air to the coldest water. A 10F temperature rise is allowed in the water passing through the fresh air coils, while the temperature rise in the mixed air coils is restricted under design condition to 5F. This restricted temperature rise insures a relative high velocity of water flow through all coils, thus forming somewhat of a cushion for extreme conditions, beyond design ranges, as are occasionally experienced. As a matter of record, the plant operating under conditions in excess of design requirements has developed capacity 20% in excess of specifications.

Proper distribution of cooled air within the various conditioned areas presented many difficulties due to the necessity of utilizing existing grille openings wherever possible. Since the interior of the building is beautifully decorated in the style of the Renaissance period, the owners were extremely adverse to any cutting and patching of walls or ceilings. In order to absolutely insure against possible drafts and stagnation, rosette-type air inlets were selected for this purpose. Installation of this device in the ceiling and a specially fabricated wall type in side walls resulted in a swirling air movement throughout all areas, but with a velocity in the occupied zones in no case exceeding 15 f.p.m. The inlets also made possible the handling, satisfactorily, of high duct velocities set up by the use of existing duct work, designed to carry lesser volumes of air in the old ventilating system. The conditions described above were obtained with ceilings as high as 28 ft. and as low as 7 ft.

Cold weather ventilation will be secured through using the same installation, plus thermostatically controlled, existing steam coils, already installed in the duct system. An appreciable saving in operating costs is assured due to proper air distribution throughout the building plus the utilization of 80% recirculated air instead of 100% fresh air as formerly used.

The author was consulting engineer for the installation. The contractor was John Borden & Brother, Philadelphia.

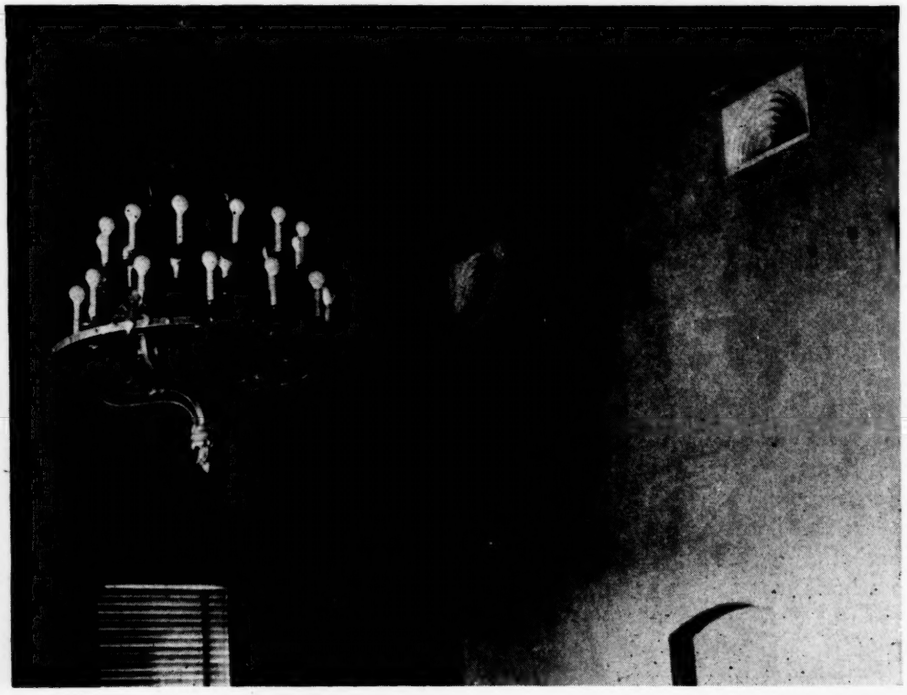


Fig. 2. Typical installation of rosette type air inlets demonstrating pleasing effect in conjunction with unusual architectural detail.

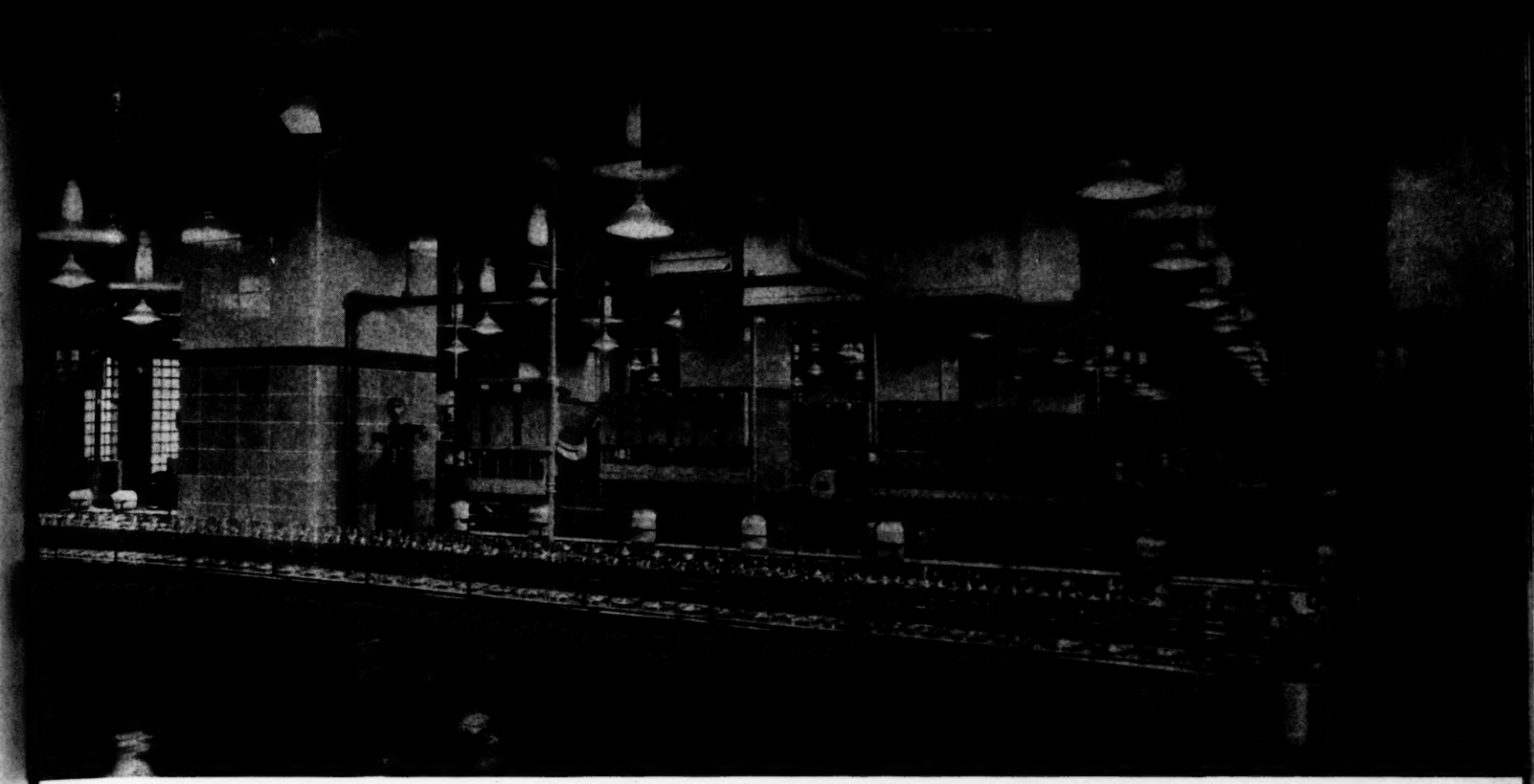


Fig. 1. Salad dressing filling room which is air conditioned by ceiling hung units.

KRAFT CHEESE COMPANY

achieves comfortable production in both office and factory at its new International Headquarters in Chicago. Heating and air conditioning systems are co-ordinated with process steam and process refrigeration requirements.

By G. HOWARD KRAFT†

THIS INSTALLATION

Owner—Kraft Cheese Company
Location — Chicago, Ill.

Architects — Mundie-Jensen-Bourke & Havens, Chicago, Ill.

Heating, Ventilating and Air Conditioning Contractor — Robert-Gordon Company, Chicago, Ill.

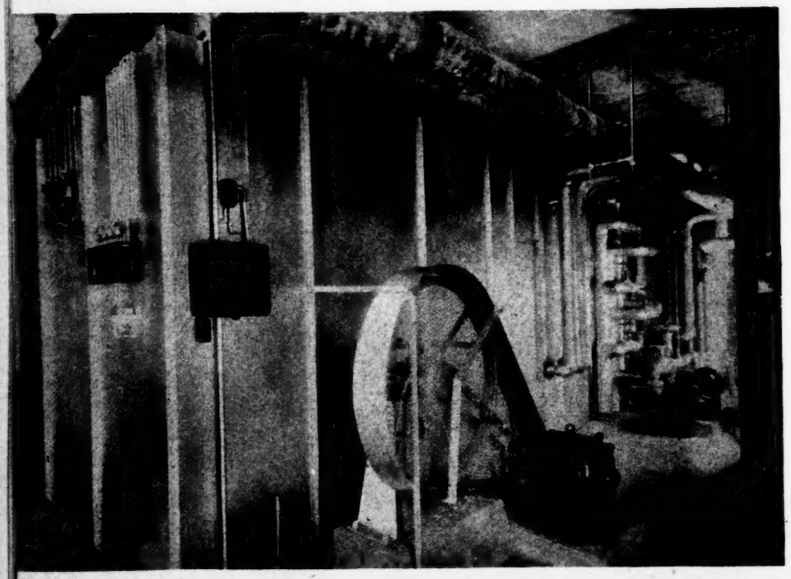
Refrigerating Contractor — Burge Ice Machine Company, Chicago, Ill.

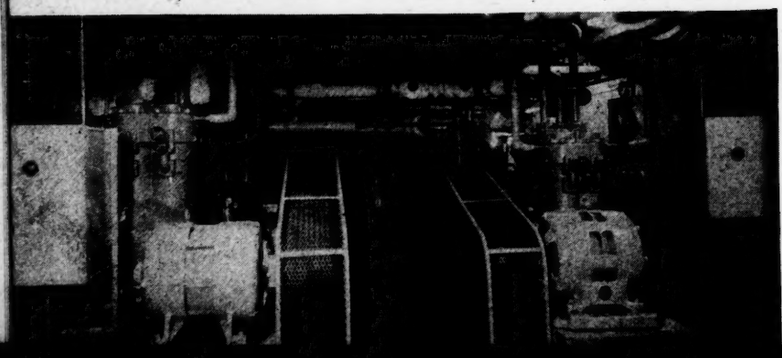
WHEN Kraft considered the problem of heating, ventilating, and air conditioning their International Headquarters in Chicago, two requirements were foremost in the minds of their engineers. The system selected must be direct in its application; and harmonize and be interchangeable with the other services and facilities required for manufacturing processes.

Since Kraft is engaged in the manufacture of food products which require refrigeration for holding and distribution, and steam for process cooking—the heating and air conditioning systems were coordinated with these two requirements. The various methods used in providing these services were selected for their simplicity and directness of application; and complications

†Chief Engineer, Kraft Cheese Company.

FOOD





such as might have been introduced by the manufacture of power and subsequent use of exhaust steam for processing, heating, or refrigeration purposes, were eliminated in order to produce a thoroughly flexible and easily operated system.

The main part of the building is an eight-floor structure, the five lower floors of which are used for manufacturing purposes. The upper three floors are devoted to offices and a central penthouse provides additional office space on the ninth floor, as well as space for air conditioning equipment on the tenth floor. There is adjacent to this building, a five-story wing used for storage and shipping purposes. A basement underlies the entire structure and provides space for various building equipment and some cold storage space. The total floor area of the building is 400,000 sq. ft.

Heating System

The building is heated throughout by the use of low pressure steam. All storage space and other sections where a mechanical ventilating supply is not required. are taken care of by the use of unit heaters, each controlled by its own individual thermostat which is suspended directly below and in back of the fan.

Manufacturing space is heated by ceiling hung ventilating units (see Fig. 1) arranged for either taking in all outside air for maximum air change or total recirculation for quick heat-up or any combination in between. These units are controlled either individually or in groups, as required, by room thermostats.

They are provided with air filters of the throw-away type and in the larger areas have duct work to facilitate the proper distribution of the heated air. Sufficient air is circulated to eliminate hot air temperatures higher than 15F above the room temperature. An additional thermostat in the supply air prevents overshooting and control is maintained by throttling the steam supply to the cast iron radiation in each unit.

In certain rooms such as the laboratory and factory offices where higher temperatures are required, additional radiation of the convector type was installed along outside walls. The main office floors are likewise heated by a combination direct radiation and ventilation system; and sufficient radiation was installed on all outside walls to reduce the temperature of the supply air to 85F or less. The air supplied is delivered through the air conditioning system.

Steam is supplied to these various units by both down feed and up feed risers located adjacent to the columns

Fig. 2. The Kraft international headquarters where the entire office (three top floors) and considerable manufacturing space are air conditioned.

Fig. 3. One of the air conditioned general office spaces. Note the air inlet and outlet grilles are combined with the indirect lighting fixtures.

Fig. 4. One of the office conditioning units. The motor in the foreground drives the main circulating fan while in the background can be seen the circulating pump and connections to air washer.

Fig. 5. Compressor room. Two "V" belt driven compressors are in the foreground while a large air conditioning compressor is in the background.

along the walls of the building. A vacuum return system of down feed risers and header in the basement, returns the condensate to the boiler feed water heater. Steam is supplied to the various risers by pressure reducing valves located at strategic points.

The boiler plant consists of two 300 hp. oil fired, three drum water tube boilers for operation at 125 pounds pressure. Since each boiler is set to develop a 200% rating, the entire heating and processing load can at all times be carried on one boiler. The oil burners are equipped for burning Bunker *C* fuel oil or heavier, and storage space is provided for two tank car loads of oil.

High pressure steam lines run throughout the building to supply steam for various process work and to the reducing valves feeding the low pressure system. A separate return system direct to the feed water heater without pump is provided for all high pressure condensate, so as not to interfere with the proper working of the low pressure heating system. The pressure carried on the low pressure heating system varies from a few ounces to several pounds.

Air Conditioning

The top three office floors (of 24,700 sq. ft. each) are air conditioned throughout. Each floor has its own conditioning unit of approximately 29,000 c.f.m. air handling capacity. A condition of 80F and 50% R.H. is maintained throughout the summer.

As mentioned before, these units are located on the tenth floor in the penthouse. Fresh air is drawn in at this level on the north side of the structure. The amount of this air is regulated by thermostatically controlled dampers which allow unlimited quantities at outside temperatures between 60 and 70F. Above and below these temperatures, the dampers close to a predetermined minimum, sufficient for ventilation, but in keeping with operating economy.

The auditorium system of by-pass is used for controlling these units. Cooling is accomplished by the use of chilled water circulated through finned type coils. A single bank air washer plays on these coils to keep them wet for good heat transfer and also to wash out any wetable dust particles. Additional control to the by-pass system is provided by a by-pass on the washer circulating pump controlling the pressure on the washer nozzles.

For winter operation, a steam heater regulates the temperature of the air washer water for humidity control. Cast iron radiation is installed before the washer to raise the incoming air to 40F in winter to prevent freeze-up. After the washer, another cast iron unit heats the air to the proper temperature for heating purposes.

Past this heater an air filter is installed of the removable medium type so that both the recirculated air and fresh air is filtered before delivery to the rooms. Fig. 6 is a schematic diagram of these units. (See also Fig. 4.) The distribution of this air is accomplished by means of both supply and return ducts. These ducts terminate in a grill combined with the indirect lighting fixtures. (See Fig. 3.) Two inlets and two outlets are installed in each 20 foot bay so additional partitions may be added without interference with the distribution system.

Each floor has a number of control zones handled by a thermostatically operated damper, so just sufficient air is circulated to each zone to maintain an even temperature on all parts of the floor. Exhaust fans are provided in addition to the main circulating fan. These fans are only run where outside conditions are such that little or no conditioning is required, and through their use large quantities of fresh air can be drawn through the building, providing ventilation to the nth degree when it is economical to do so.

Certain parts of the manufacturing spaces are also air conditioned, where proper control of the atmosphere is essential to the production of quality merchandise. These include all space for candy manufacturing where a condition of 65F and 50% R.H. is desirable, also the salad dressing filling floor where standard conditions of 80F and 50% R.H. are maintained.

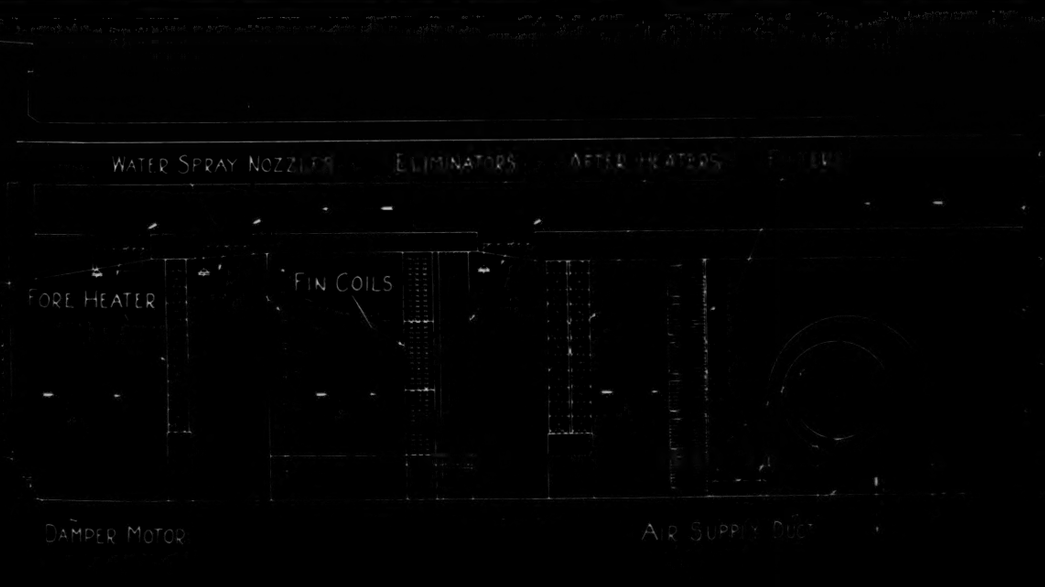
Besides these spaces, the entire laboratory, manufacturing supervisors' offices, visitors' reception room, employees' lunch room and a sales office on the first floor are air conditioned for the comfort of the occupants.

Cooling Medium

All of these various conditioning units and the main office units are supplied with 47F chilled water for a cooling medium. The chilled water is cooled in a shell and tube cooler of 2,656 sq. ft. in the basement by direct expansion ammonia. At peak load, 900 gal. per min. are circulated, out at 47F and back at 55F.

The candy rooms and certain other relatively high temperature refrigerated spaces are supplied on a

Fig. 6. Schematic diagram of one of the office heating, ventilating, and air conditioning units.



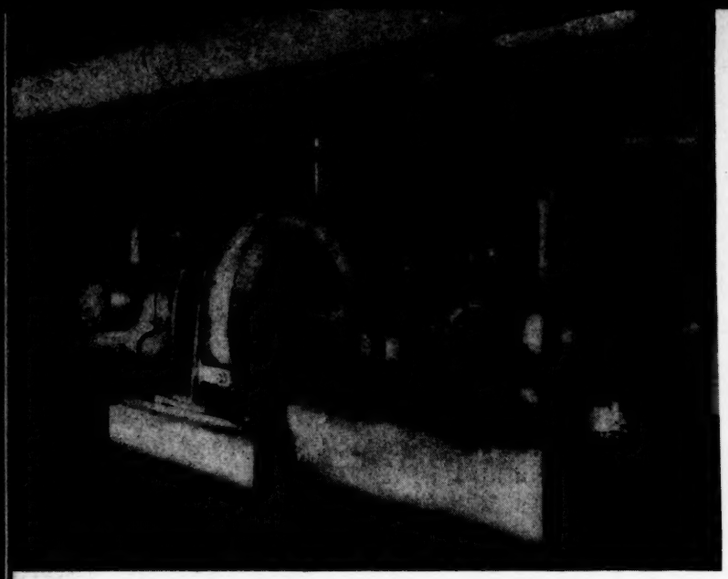


Fig. 7. Close-up view of the duplex air conditioning compressors of 340 tons capacity. These compressors are used to cool water to 47F for use in the air conditioning units.

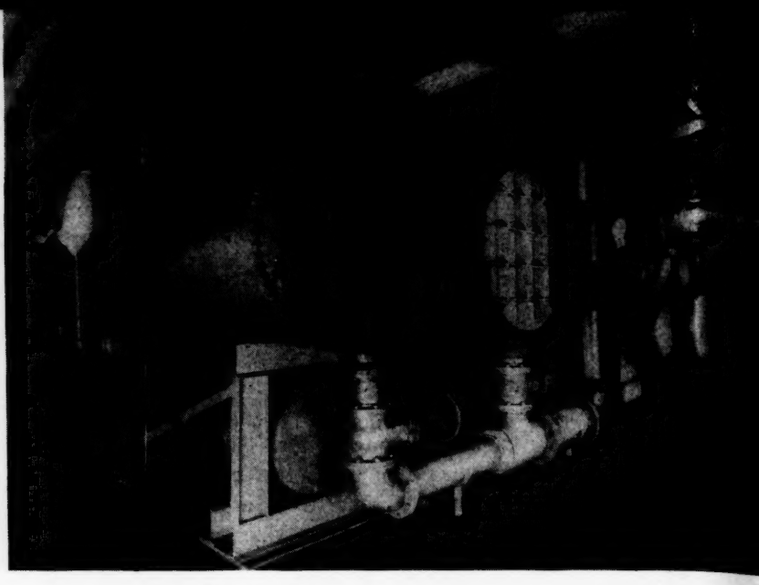


Fig. 8. The 2,168 sq. ft. shell and tube ammonia condensers. In the far end of the room can be seen the chilled water cooler with two brine coolers in front of it.

smaller but similar system circulating 34F calcium chloride brine. This system has a shell and tube cooler of 938 square feet and circulates at maximum capacity 230 gal. per min., out at 34F and back at 42F.

In addition there is a colder brine system carried at 15F to 20F for certain process jobs and for small rooms where it was not practical for direct expansion ammonia.

The remainder of the refrigerated spaces on the first floor and basement use direct expansion ammonia.

Refrigeration

The total load on the refrigeration plant is as follows:

47F Chilled water for general air conditioning	340 tons
34F Brine for special air conditioning	70 "
20F Brine for special process and refrigerating purposes	30 "
Direct expansion ammonia for refrigerating purposes	45 "
Total	485 tons

To carry this load effectively, three suction pressures are maintained. A 60-pound header (temperature of ammonia 40F) takes care of the chilled water load and is maintained by a duplex two-cylinder 10½ in. x 10½ in. compressor unit operating at 300 r.p.m. direct connected to a 250 hp. synchronous motor (Fig. 7).

A two-cylinder 8¼ in. x 8¼ in. compressor operating at 360 r.p.m.—*V* belt driven by a 75 hp. induction motor—maintains the 40-pound suction header (ammonia temperature 26F) for the 34F brine load.

Another two-cylinder 10½ in. x 10½ in. compressor running 300 r.p.m. and driven through *V* belts by a 125 hp. induction motor has a capacity of 75 tons at a 20-pound back pressure (5F ammonia) and takes care of the low temperature brine and direct expansion load.

All of these compressors are equipped with capacity reduction valves for 1/6, 1/3, 1/2, 2/3 and 5/6 capacity so the correct back pressure can be maintained regardless of load conditions. Besides giving superior control, this arrangement makes for considerable power savings. Also each compressor is equipped with a split suction manifold so one cylinder of a machine can be run on one back pressure and the other cylinder on another. Each section of the manifold is cross-connected to the various suction headers so that any part of any machine can be used on any part of the load.

This cross-connection is of utmost importance in the operation of the large synchronous motor driven unit. Oftentimes the air conditioning load only requires two or three of the available four cylinders to properly carry it. In such an event one or two of the cylinders of this unit can be transferred to other headers and the large unit kept fully loaded, resulting in the shutting down of one of the other compressors.

This cross-connection of capacity also makes it unnecessary to install any reserve capacity to insure refrigeration at all times for perishable goods. With this arrangement the entire air conditioning equipment is available for refrigeration purposes if needed.

All compressors discharge on their high side through a common header into two shell and tube condensers with a surface of 2,168 sq. ft. each (Fig. 8). A total of 1900 gal. per min. of cooling water can be circulated over the forced draft cooling tower located on the roof. This tower has two 800 gal. per min. spray headers and two 150 gal. per min. spray headers. The two large headers have separate pumps and the two small headers are connected to a two-speed motor driven pump capable of delivering 150 or 300 gal. per min. The tower draft is supplied by three 102-in. dia. propeller type fans, one of which is two-speed for minimum operation.

Through the above arrangement it is possible to circulate just the proper amount of water to efficiently handle any given load and supply air to the tower in proportion. At times when the air conditioning load is off, it is often possible to carry the refrigeration load on the tower without use of any fans, by merely circulating the water and leaving all dampers open so that the air circulates through the tower by gravity. Here again the large size air conditioning equipment is economically used on the smaller refrigeration load.

The tower itself is made of steel panels with a welded steel pan. No fill is used inside the tower so it is readily available for painting. The moisture eliminators located across the top are made of redwood. The tower is designed to cool the water to within 5F of the wet bulb temperature when operating at its maximum capacity of 1900 gal. per min.

The system has now operated very successfully through two cooling and one heating seasons to the mutual satisfaction of the engineers who operate it and the Kraft employees who enjoy it.

METAL WORKIN

CUMMINS ENGINE COMPANY

expands its plant with new structure housing fuel pump and injector departments. Vapor-laden air from injector tests exhausted through oil separator which reclaims 90% of fuel used. Plant heated by oil-fired steam plant and unit heaters.

By CLIFFORD STROCK

DURING 1939 the manufacture of fuel pumps and injectors for the Cummins diesel engine was transferred to a new one-story building. This new plant reflects the steady growth of the Cummins Engine Company which had its origin in a little garage 23 years ago. The new structure with its modern equipment and specially-designed machinery is responsible for a 25% reduction in rejects of pumps and injectors.

General

The new plant is 202 ft. x 82 ft. in plan and is of saw-tooth one-story construction. Activities carried on in the new addition are, in general, those relating only to the injectors and fuel pumps; the addition provides space for the injector machine shop, injector assembly, fuel pump assembly, fuel pump tests and, in addition, the boiler room, service department, and a small office. High working efficiency is aided by an even distribution of daylight through saw-tooth monitors, continuous side wall sash and clear glass partitions. Combination mercury vapor-mazda lighting units provide a minimum of 70 footcandles at the working plane. Pumps and injectors are assembled in a sealed room where filters in the air supply insure the high degree of air cleanliness desirable in precision work. Other departments are similarly equipped.

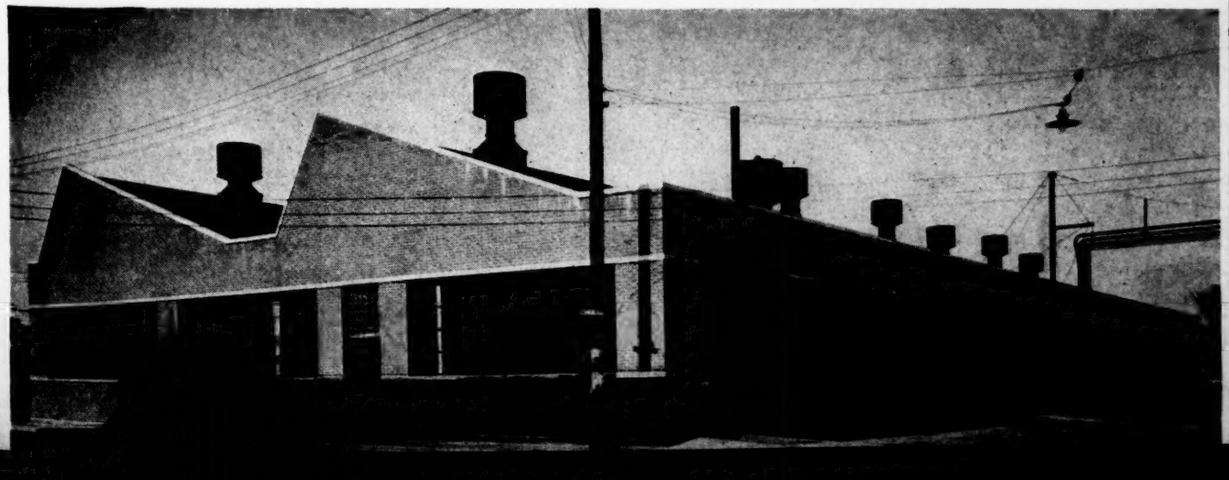
PROFITS IN AIR

NO. 17 OF A SERIES SHOWING HOW INDUSTRIAL PLANTS PROMOTE PROCESSES AND PROFITS BY SCIENTIFIC CONTROL OF AIR CONDITIONS

THIS INSTALLATION

Owner—Cummins Engine Company, Columbus, Ind.

Engineers and Builders—The Austin Co., Cleveland



1 FUEL INJECTORS AND PUMPS for Cummins diesel engines are manufactured in this modern, saw-tooth building. Rejects were reduced 25% due to modern equipment and specially designed machinery housed in this building erected during 1939.

2 FLOOR PLAN shows location of space for injector machine shop, injector assembly, fuel pump assembly, fuel pump tests, boiler room, service department, and small office. A steel firebox boiler burning heavy oil supplies low pressure steam to 13 unit heaters and two radiators for heating. Four of the unit heaters are of the centrifugal-blower type.

3 UNIT HEATER of the propeller type is used to heat this portion of tool room and tool crib. Of the 13 unit heaters in this plant, nine are of the suspended propeller type whose locations are indicated in the drawing in Fig. 2.

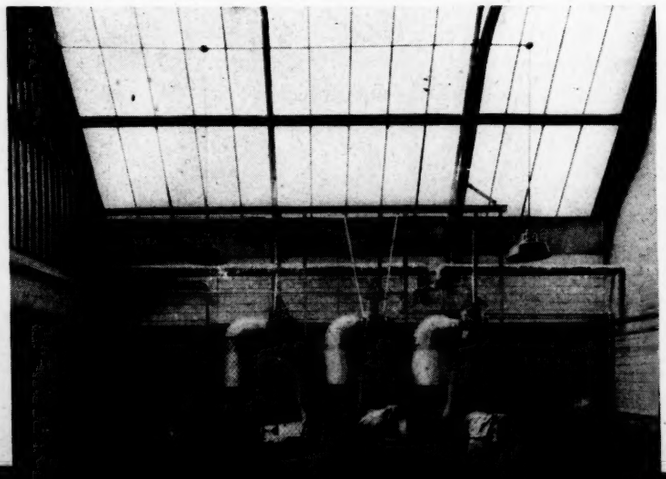
4 INJECTOR MACHINE SHOP. Welded "tree-form" columns support saw-tooth roof and eliminate need for cross bracing which produces shadows. Electro-plating room in background is capped by a ventilator as shown in Fig. 5.

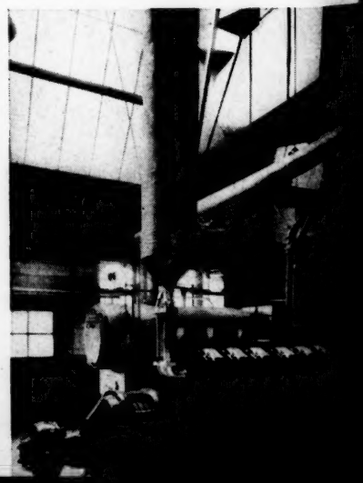
5 ELECTRO-PLATING ROOM. Louvers in lower wall allow air from surrounding space to enter plating room, pick up fumes and then flow through roof.

6 FILTERS in centrifugal blower type unit heater in center of picture clean all air entering this fuel pump sub-assembly department. Capacities of these centrifugal blower type units range from 71,200 to 335,000 B.t.u. per hour. The unit shown here is No. 1 in Fig. 2.

7 INJECTOR assembly and test department. In background are three injector test stands where injectors are tested at pressures from 300 to 2000 lb. per sq. in. Collecting systems over test stands recover 90% of oil vapor used in tests and increase comfort and cleanliness of workspace. All air to this room is cleaned by filters in unit heaters.

8 BOILER ROOM. In foreground is a diesel-driven generator which supplies power and light. The diesel is a 500 hp. Cummins engine and drives a 250 kw. generator. In background is a steel boiler burning heavy oil.





Dust collectors have been installed in the large space where machining and grinding operations are concentrated. Plating is carried on in a glass-enclosed room in the center of the machining and grinding area. Louvers in the lower walls of this room, and a ventilator hood which completely caps the room and extends up through the building roof, provide circulation which exhausts the fumes from the plating tank.

Fuel pumps and injector test facilities have been improved so that each operator can now handle four times the number of units he could turn out in the old plant.

Vapor Collecting System

Fuel economy and greatly improved working conditions have resulted from the operation of a vapor collecting system in the injector test room in the new plant. It is necessary to test each injector before it is assembled on the engine; formerly the vapor from the fuel built up an undesirable atmospheric condition around the test stands. In the new plant, where three test stands are provided, each is equipped with a vapor hood and duct leading to a vapor arrester through which the air and vapor are drawn by a motor-driven blower and thence to discharge.

The vapor-laden air is drawn through the vapor arrester, which is a centrifugal collector filled with compressed steel turnings; the vapor is condensed when it strikes the turnings, and the liquid oil drips from the bottom of the collector to an oil drain, then to a chamber where the fuel is recovered. The general arrangement of this system is shown in Fig. 9.

The vapor arrester recovers 90% of the oil which is fed to the injectors, whereas formerly all of it was lost. Working conditions have been immeasurably improved.

A 500-hp. Cummins diesel engine, directly connected to a 250-kw. generator, provides power and light for the building. Power is supplied to individual machines by an overhead buss duct suspended from the roof. Provision is made for installation of an additional 500-hp. diesel at a later date. A 1000-gal. underground oil storage tank outside the building supplies the diesel and the oil-burning heating boiler.

The boiler is a steel firebox type unit equipped with a heavy-oil burner. Sufficient low-pressure steam is generated to supply 13 unit heaters and two radiators located throughout the building, as shown in Fig. 1. Of the unit heaters, all but four are of the propeller-fan type, with capacities ranging from 41,500 to 150,700 B.t.u. per hr. Four of the units are of the centrifugal-blower type and have capacities ranging from 71,200 to 335,000 B.t.u. per hr. In the case of Unit No. 2, an extension is placed on the outlet to supply heated air to the fuel pump test room. A thermostatic steam trap is installed on each unit heater, and a drip trap is provided at the end of each main where it drips to the condensate return lines. Condensate flows back to a condensate pump in the boiler room and thence to the boiler.

Each of the blower type unit heaters has connections to the outside and has sufficient capacity so that, altogether, they provide three air changes per hour in the building. Each of these four unit heaters is also equipped with filters to clean all air passing through, both outside and recirculated. The relative proportions of outside air and recirculated air supplied to the unit heaters is hand controlled.

Motorized ventilators are installed in the roof to allow for the exhaust of vitiated air quantities equal to that supplied through the unit heaters from outside.

9 VAPOR COLLECTING SYSTEM for test stands. Vapor laden air is drawn through centrifugal collector filled with steel turnings. Oil condenses out and is piped to an oil collecting chamber. The result is that vapor laden fumes are removed and oil is economized.

DUST CONTROL

in industry is dealt with in this series of three articles which outlines a program for a complete system of dust control.

By F. F. KRAVATH†

THE subject of hoods has been purposely left for the last because the writer wished to stress its importance in the exhaust system and in dust control in general. The hood is the most important single item in dust control. An otherwise good exhaust system with poor hoods provides poor dust control, while good hoods and a poor system may provide even excellent dust control for a time. Perhaps the most important rule to be remembered in hood design is to enclose the object creating the nuisance as completely as possible. Thus, the air requirement will be made a minimum. Figs. 5 and 6 illustrate the degree of enclosure necessary for good performance at minimum air volumes. Ruggedness of construction is an important item, since a rugged, well-constructed hood will outlive many lightly built hoods, giving better over-all performance, a much finer appearance, and costing considerably less in the long run. As a matter of fact, the difference in cost between two hoods of identical shape, but different metal thickness is just about the difference in cost of the metal itself, since labor will generally be the same.

Referring to Fig. 5, here is illustrated a ⅜-in. thick steel plate, all welded hood with a safety-latched, easy access door for removing the grinding wheels trimmed. It can be seen that such a hood, if anything, adds to the appearance of the machine. The wheel is situated well in from either side of the hood. This is an essential point in hood design, regardless of the type of hood. The air-stream entering the hood must be broad enough to overlap the intensely dusty area, in order to effectively catch all the dust. It is also essential that the entering air velocity be a maximum where the dust is created. Thus, the exhausting branch pipe must be correctly located with reference to the air inlet. From the same illustration, it can be seen that air entering the hood is induced to follow a direction straight across, horizontally, to the rear of the hood, where the transforming outlet is located. Thus, the highest velocity will be located in the exact center of the hood, where the resistance to flow is the minimum, and where the dust concentration happens to be the greatest.

It is essential in enclosing any process that adequate light be supplied to illuminate correctly the work being performed. Provision for this is shown in the same illustration. Another point to be remembered is to have the exhausting branch located so that the entering air stream is a favorable component of the direction in which the dust is thrown off. Thus, with the grinding wheel shown revolving in a counter-clockwise direction, the heaviest material is thrown directly downwards into the chip trap of the hood. The lighter dust is picked up by the revolving air stream which is in excess of 3000 ft. per min. and under the action of both centrifugal force and the air stream crossing the hood, is induced to leave the path it might otherwise follow.

Some other features that can be noticed in Fig. 5 are the butterfly damper for shut off, the blast gate for regulating flow (placed well out of reach of anyone's hands), the flanged, sectioned main piping and the transformer connection between hood and branch pipe for the purpose of reducing the entrance losses to the branch pipe.

It is good sense to experiment with lighter gauge sheet metal where the final shape of the hood is undecided. One point often brought up is the lack of sufficient air (to experiment with) due to an obsolescent system. To which the writer answers that better, more economical results will be obtained by experimenting with poor air than with sufficient air. Accurate design becomes the criterion. It must be borne in mind that almost every hood must be tailor made. It is rare indeed that it is possible to fit one hood to two different type or size machines, because while the hood may enclose the process, it may cramp the operation, it may require more air than necessary (and air

†Assistant Plant Engineer, Abrasive Company, Philadelphia.

is expensive), or it may provide insufficient dust control. A good hood must not impede the operator, but on the other hand, for the sake of good dust control, it is often necessary to change the method of performing the operation slightly, and perhaps slow it up temporarily. This will generally be found to be temporary only since whatever time may be consumed in performing a new twist or turn is more than made up in the cut in the time the average operator will, after good dust control is effected, find cause to be doing other than performing his actual, paid-for routine.

PART III—HOODS, INSPECTION, MAINTENANCE, RESPIRATORS AND SOURCES OF INFORMATION

Inspection and Maintenance

It is absolutely imperative that all exhaust equipment be inspected and tested regularly to insure detection of defects in apparatus before they cause a shutdown with inconvenience to all and considerable expense to the company. Thus leaks may be detected before they have become dangerously large, causing overloading of the fan motor, wear or unbalance of the fan blades, damage to the filter, or poor performance.

In the case of an interruption to the water supply, it is possible for a washer handling considerable dust to completely plug up the drain pipe in a matter of minutes. Thus, interlocking switches and valves are necessary to shut the fan down as soon as the water supply fails. There are any number of ways in which exhaust systems deteriorate. They are generally alike in this respect, however, that caught early they are simple and cheap to repair, but allowed to become worse without checking, they are generally expensive to return to good operation. Fig. 7 shows examples of a number of actual inspection instructions which, oper-

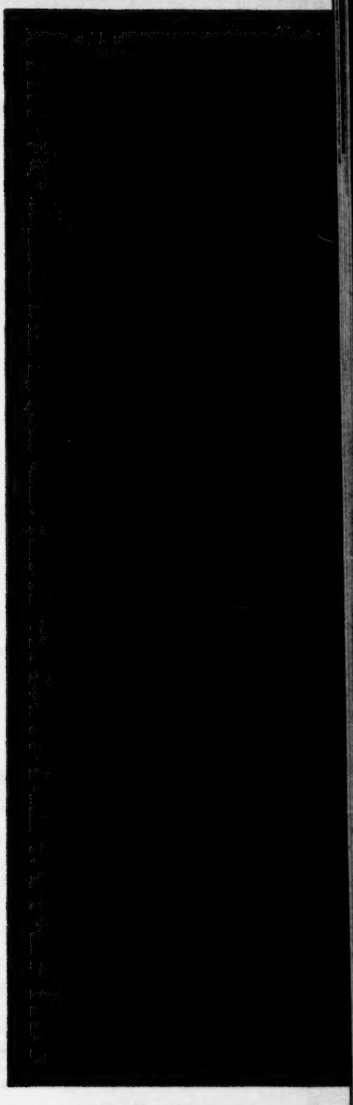
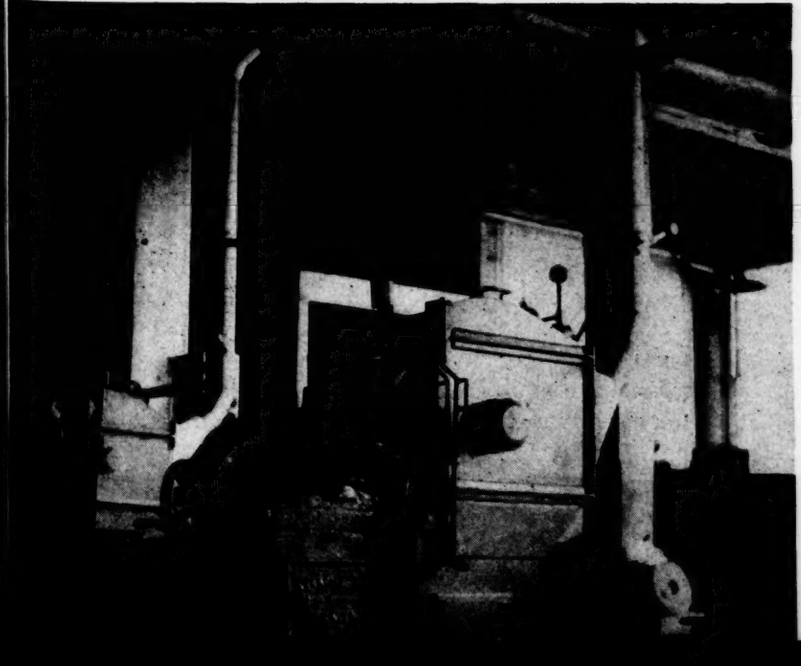
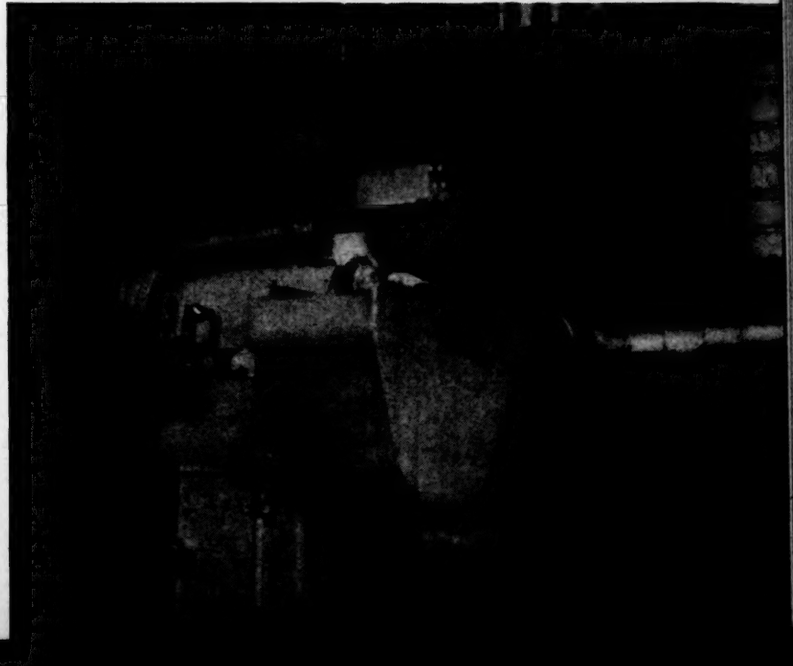


Fig. 5. (Below left). Illustrating the degree of enclosure of a grinding wheel dressing machine.

Fig. 6. (Below right). Small grinding wheel dressing machine. Note degree of enclosure as well as width of hood. Counterweighted trap at bottom facilitates removal of coarse material.





INSPECTION NO. 161

Fan Drive on Kiln Room Roof—Siding Room Exhaust System "A"

Tools Necessary: Tachometer, pencil, inspection report card, adjustable wrench, flashlight.

Check fan speed and motor speed: record each before any adjustments are made. Then eliminate any belt slip by adjustment of drive. Record final fan speed and motor speed. Check drive, general cleanliness and condition of belts.

Lubricate fan and motor bearings. Check motor for heating or sparking.

Report condition of belts and drive in general.

This sheet to be shown to engineer in charge of dust control.

INSPECTION NO. 163

Exhaust System "A" Siding Room

Tools Necessary: Velometer and necessary attachments, tachometer, pencil, inspection report card.

Check volume of air being handled by fan and total pressure against which fan is operating.

Check branch volumes against discharge volumes to indicate leaks in piping.

Record all data.

This inspection to be by engineer in charge of dust control.

Fig. 7. Examples of forms used in insuring that inspections of exhaust systems are carried out properly and regularly.

INSPECTION NO. 164

EXHAUST SYSTEM "A" SIDING ROOM

Tools Necessary: Flashlight, pencil, inspection report card, suitable container and scraper.

Check piping for leaks, especially bends, elbows, reducers, etc.

Check all cleanouts to see if pipes are filling up.

Inspect all hoods thru-out entire system, making sure all lids, doors, etc., are on hoods and in use. Check general condition of hoods and report condition of same as well as signs of deliberate misuse.

This sheet to be shown to engineer in charge of dust control.

INSPECTION NO. 169

Air Washer on 3rd Floor - Box St'ge.—Pacing Room Exhaust System.

Tools Necessary: Inspection report card, pencil, flashlight, adjustable wrench.

1. Open top inspection door—examine closely for wear or rust.
2. Open middle inspection door—examine closely for wear or rust. Start up fan and pump and examine nozzles for water spray. Each nozzle should have a wide spray and not a drip.
3. Open bottom inspection door—examine closely for wear or rust. Remove all dirt accumulated at drain. Check drain for wear.
4. Check outside of tank for water leakage out or air leakage in.
5. Check discharge pipe from fan for leakage either way.
6. Check discharge pipe on roof at weather cap for rust and for a condition akin to raining. Air should be damp leaving pipe but there should be no rain.
7. Check supply and drain valves for satisfactory operation.
8. Check pump packing for leakage.

ated on the tickler system, present themselves automatically on the proper date. Such systems, while extremely simple, are very effective, and constitute the best sort of insurance.

Respirators

While respirators should not be depended upon as the sole means of dust control in any plant, there nevertheless are many occasions where they must be used as an adjunct to, in place of, or during servicing of the exhaust system. While plans are being drawn for an exhaust system or during that time that equipment is in process of erection, which may constitute a period of as long as two years, the dust respirator is a valuable substitute for the exhaust system. If, for some reason or other, an exhaust system should become inoperative for a few days, the respirator must be resorted to in order to carry on production. Some operations like the sweeping of floors are dusty and yet, obviously, cannot be protected by exhaust systems. For these operations, respirators are ideal.

Where it is decided that dust respirators should be worn on certain operations, memorandums should be issued covering this, as well as the fact that disregard of these orders will constitute sufficient reason for dismissal. The respirator is of value only when worn at every exposure to dust. If worn only 25 or 50% of the time, its value is negligible. On the other hand, the respirator is at best a distinctly uncomfortable and distasteful piece of equipment to wear, and constitutes a definite breathing load, so that not only should the operator be allowed rest periods, but a laundry service should be established whereby the operator will receive his own respirator cleaned and sterilized, as well as completely overhauled each week.

Sources of Information

Many engineers desiring information on various phases of dust control are often stumped when it comes to locating a source for it. Following are listed various agencies, books, and other reliable sources for such information:

1. The plant's insurance carrier.
2. Trade journals like HEATING & VENTILATING.
3. Membership in organizations like Air Hygiene Foundation, American Foundrymen's Association, Grinding Wheel Manufacturers' Association, all of which offer medical, legal, and engineering literature or sources of same on dust control.
4. State codes, bulletins, pamphlets, and reprints of technical talks on this subject.
5. Attendance at state health department forums.
6. State inspection departments can arrange for visits to worthwhile installations or for access to literature in their own files.
7. Books like the following: *Industrial Dust Control,* by Drinker and Hatch; *Exhaust Ventilation,* by Alden; *Fan Engineering; Air Conditioning and Engineering; Fans* by Baumeister.
9. United States Public Health Service Bulletins.
10. Personal visits and consultations with industrial plant engineers, who generally are glad to offer whatever assistance is possible.

Facts and Fallacies in Heating Piping

PART 2—PIPING AROUND BEAMS AND DOORWAYS; METHODS OF LIFTING CONDENSATE.

By T. W. REYNOLDS

This is the second part of a series of articles in which the author makes some suggestions and criticism regarding common steam piping practices. The first article appeared in the April, 1940 issue on page 46. Additional parts of this series will appear in succeeding issues.

FIG. 5(a) shows the standard method of making a jump up around a beam or other interference which should be wrong on a number of counts. In the first place it violates standard practice and to be consistent with such practice should carry the water past the rise and then reduce for drainage as shown in Fig. 5 at (b), a method which also retains the principle of easy flow for the steam and requires reducing fittings of a kind easier to obtain. It would seem that the method shown at (c) in Fig. 5 is the most preferable as the full size pipe is much less likely to stoppage from sediment and can handle a sudden rush of water to better advantage. Expensive reducing fittings are avoided and it is doubtful whether in most cases such fittings could be obtained to effect the reduction without the use of one or more bushings.

The draw off valve is optional in Fig. 5(c), unless the building is not heated for long intervals at a time, but some provision for convenient drainage is an absolute necessity with piping methods such as shown at (a) and (b) in Fig. 5. In some locations the use of a brass cap may be more advisable than a valve, but in any event a plug should not be used in lieu of a cap as the difficulty of its removal makes it quite likely that the pocket will never be drained or freed of sediment. As for the 1-in. drop as called for at (a) in Fig. 5, this is unnecessary as long as the grade of the pipe is maintained from one side of the beam to the other.

In actual practice the necessity for any of these connections is rare as the problem can usually be solved by dripping the rise to a return, thus avoiding any possibility of trouble from sediment or water and with the added advantage that more likely than not a reduction in main size can be effected at this point, which together with the elimination of reducing fittings otherwise used may make the drip to the return much cheaper to run. Fig. 5(d) shows a most inexpensive way of accomplishing the purpose through the use of a runout as the horizontal portion of the drip, where a riser is not too far removed from the point in question. This method does away with water and sediment difficulties, frees the main of its water, eliminating return

A NOTE BY THE AUTHOR

Standard piping connections are slavishly reproduced and passed on from one author to another. Quite often they also form an impressive part of our plans and a sacred niche in the specifications. Here they receive most honorable mention before being passed on to the contractor, yet the advantage of many of these connections seems extremely doubtful. This, we do know: they serve but to increase the cost.

These so-called standard piping connections were not originated in this era, but are hangovers from opinionated ideas of long ago which having gained vogue are now hard to dispel. They show little or no change from those thirty years back, notwithstanding the rapid changes that are continuously taking place in practically all other phases of heating.

The need for each of these connections is commonly defended by certain assumptions, or by a line of reasoning which off-hand seems logical because the reasoning is not pursued far enough. Such reasoning might have had some justification in other days where water in pipes was a troublesome factor and when but little was definitely known of what actually took place inside a pipe or fitting. Today we have intensive research with glass pipes, colored liquids and with pipes whose arrangement may be quickly changed at will so as to produce any desired condition for experiment.

Experience acquired in contracting, as well as in trouble shooting over a long period of years at the rate of several trouble jobs per day, eventually caused the writer to show no hesitation in repeatedly violating with impunity many of these sacred traditions with no harmful results. With this in mind, the elimination of waste, and in some cases betterment of method, it is the writer's thought to present herein a number of changes in piping methods which the writer has found along with some others to be the better way. In general these piping methods refer to connections as used in a one pipe steam heating system. Connections common to other systems are so noted, or if not their application is obvious.

of water from the riser and counterflow in the runout, and helps out the riser.

The inverse of a large pipe jumping up as indicated at Fig. 5(a) is shown at (a) in Fig. 6, where the larger pipe jumps down as water line below the doorway and the small air line jumps up in a loop over the door. This is typical of a condition which is not infrequent in a vacuum return system. However, with the omission of the air line the sketch applies equally well to a condition which sometimes occurs in the wet return of a one pipe system. The lower pipe should be well covered if the doorway is to the outdoors and especially so if the door is loosely fitted at the bottom and if the pipe is small and partly filled with sediment, as pipes in such locations have frozen solid during the night while the boiler was standing by. If the boiler is forced in the morning water will be quickly evaporated over to cold pipes and radiators, emptying the boiler as the water is prevented from returning. As a consequence boiler sections will warp, or should the water later return or fill valve or water supply valve be opened by an attendant, the boiler will crack.

In the case of a vacuum return system the air line shown at (a) in Fig. 6 can be omitted where objection is made to its appearance, simply by the use of lifts as obtained by means of special suction lift fittings (see (b) in Fig. 6) or as assembled by means of ordinary pipe fittings, as illustrated in Fig. 7. Lifts should be used sparingly and only where unavoidable, and where used are best obtained by some form of patented device as shown in Fig. 8. Such a fitting has more certainty of continuity in operation than a lift made of standard fittings as usually installed with only ordinary care; furthermore the labor involved in the assembly of a homemade lift makes it the more expensive method.

Lifts in the return call for greater terminal vacuum with consequent greater expansion in volume of elastic fluids, thus calling for greater pump displacement and

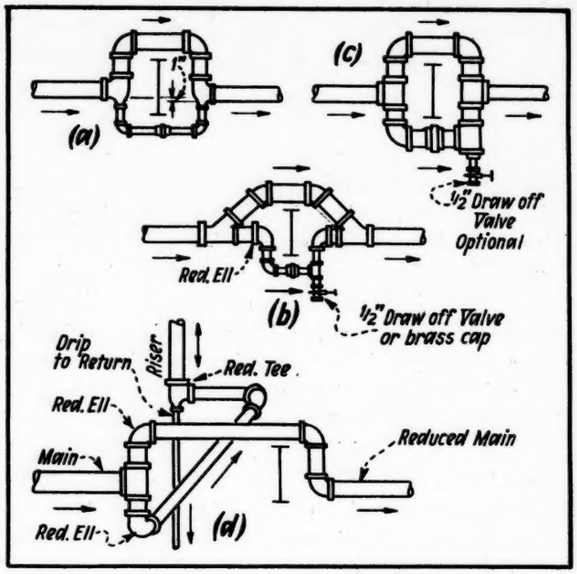


Fig. 5. Two pipes in a one pipe steam system for getting under and over beams, (a) poor method, (b) better method, (c) and (d) preferred methods.

power consumption. The power or differential pressure required is a maximum of ½ lb. pressure or 1-in. of vacuum per foot of elevation of lift; however, in most cases the power required is a much smaller figure. Infiltration of air into the system is usually such as to make the column lifted much lighter because of air and water mixture.

Lift fittings are used in pairs (see Fig. 8) with the upper one inverted so as to prevent the water from falling back, thus avoiding any additional pipe fitting as otherwise required for the loop as shown in Fig. 7. They are provided with bottom clean out plugs and designed with smooth lines for least resistance to flow. Lifts of over five feet are best obtained in step formation with 5 ft. steps, each with a pair of lift fittings, and with piping between each step graded towards the pump.

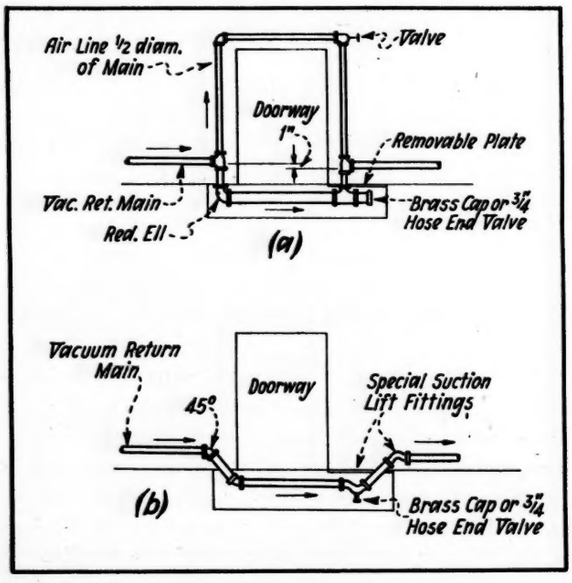


Fig. 6. Getting returns past doorways in vacuum systems by (a) passing the air over the door and (b) lifting the air and water at the doorway.

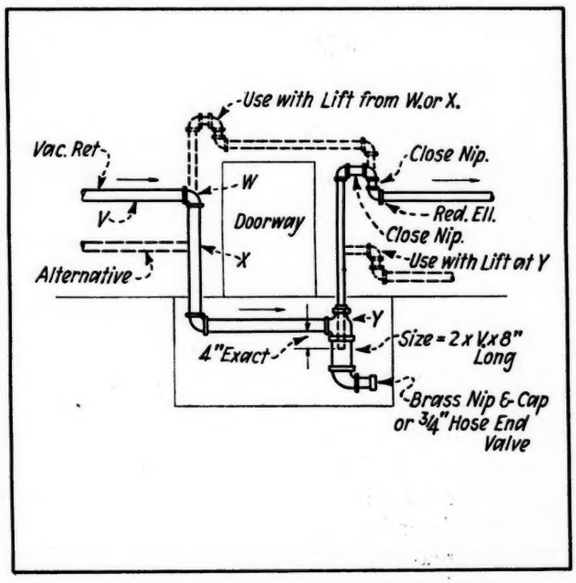


Fig. 7. Alternative methods of lifting vacuum returns at doorways by means of a lift as assembled from pipe fittings.

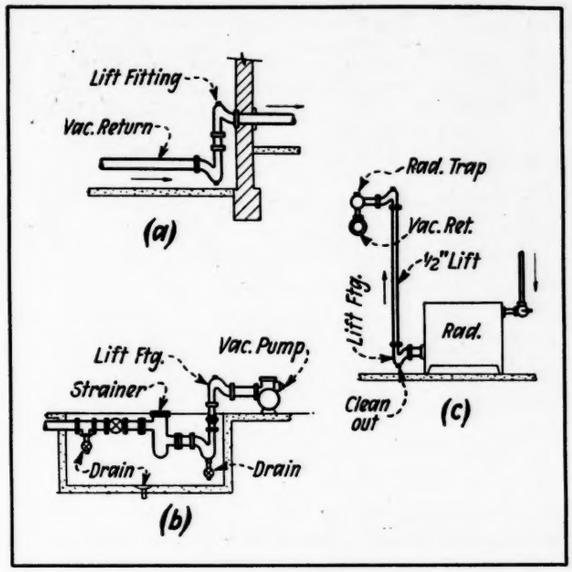


Fig. 8. Showing the use of special suction lift fittings for overcoming conditions sometimes encountered in vacuum return systems.

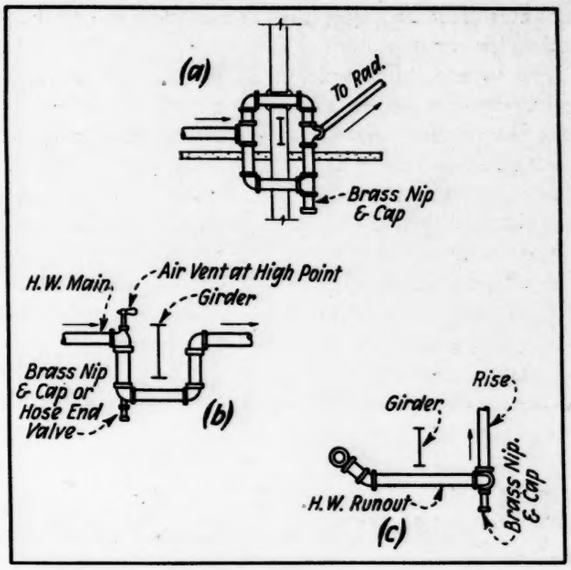


Fig. 9. How steam and hot water pipes may be successfully by-passed over or under interferences such as steel beams.

Lifting of condensation vertically in a lift is accomplished due to the well formed by the submersion of the lower end of the lift fitting below the return, the seal thus formed causing a slight reduction of the vacuum or a higher pressure on the inlet side. The difference in pressure thus produced forces the water from the well through the vertical lift to the higher level in slugs on the air lift principle. A lift fitting must be correctly proportioned for capacity of well and for the area of inlet to outlet with vertical lift pipe usually two sizes smaller than the main return.

Lifts of over 5 ft. can be accomplished in one step if necessary by deliberately admitting air into the system at a point approximately one-third the height of the lift. At this point a ⅛-in. pipe may be connected and this pipe equipped with a valve which in operation is but slightly cracked open to admit air only in small quantities. This produces a lightening or aerating effect in the column lifted, similar to that effected by the use of an air lift pump, whereby air at a higher pressure is admitted to the water near its lower level. The inherent expansive force of this air raises the water and being in bubbles of various sizes it produces a column of water lighter than another of the same height, consequently the water is raised above the level of the surrounding water. The small pipe must be extended to a point slightly above the top of the loop at the higher return, at which point it is left with end open to the atmosphere and fitted with an air screen. The objection to this method of lifting returns is due to the necessity of admitting air to a system from which we are trying to eliminate air by means of a vacuum pump. At (b) and (c) in Fig. 8 are shown still other cases where lift fittings may be used to good advantage.

The various sketches showing how to pass beams and doorways apply equally well to any other form of interference, such as sewer, gas or water pipes crossing at the same elevation, as sometimes occurs in the case of an underground main return in a vacuum pump system. Fig. 9(a) shows the adaptation of the jump up method as an encirclement of a steel beam interfering with a one pipe steam radiator connection. This presents an interesting problem as in this case the steam and water are counter flow. Figs. 9(b) and 9(c) show how interferences are overcome in hot water heating systems. Fig. 9(c) also applies to a steam system, the only change required being a drip from the base of the rise.

Humidity Control in Porcelain Testing Laboratories

Vitreous (porcelain) enamels are harder to break in dry weather than in damp weather according to the results of a study recently completed by D. G. Moore of the Bureau of Standards enameled metals section. It was found that when 20-gage angle irons were enameled and tested by twisting until the enamel chipped at the apex, the angle of twist required to cause failure was 15% greater with a 35% relative humidity than with a 98% relative humidity, the temperature remaining constant.

Previous reports of other investigators have shown that such properties as resistance of whiteware glazes to abrasion by falling sand, the transverse strength of glass bars loaded at placed scratches, and the tensile strength of fused-quartz filaments a few microns in diameter are also affected by large changes in atmospheric humidity. From these tests it is evident that in testing of physical properties of materials such as vitreous enamels, glasses and ceramic glazes, humidity should be taken into account to obtain consistent results.

Fig. 4. Decay of sound in test plates. The shorter oscillogram was taken with a very effective deadener; the longer with a good deadener. Some deadeners on the market would give a record over six feet long if taken at the same film speed as used for the above.

How to Use Sound-Deadening Materials in Air Conditioning Equipment

By PAUL H. GEIGER†

IN the article in last month's HEATING & VENTILATING four general methods of solving machine noise problems were mentioned and the method of absorbing air-borne sounds was described in detail. The other three general methods will be discussed here, starting with the applications of materials useful in damping out vibrations in solids, thereby reducing the amount of sound radiated into the air. These materials are commonly called *sound deadeners* and due to the demand of the automotive industry they have recently been developed to a stage where they are of great value when used in the proper way.

Damping of Vibrations

Sound deadeners are made in several forms; some are made as a semi-liquid so as to be applied by a spray-gun and then baked or air dried; others are made in the form of felts or blankets to be applied by an adhesive; still another form is that which is laid on the surface to be covered and then heated to be made to adhere. The principle upon which all deadeners work is that most of the energy required to bend them (or to produce any other form of relative motion between different parts) is converted to heat and not stored in the form of potential energy as is the case when a spring is compressed. In other words, a good deadener must offer frictional resistance to motion. A few materials appear to be *springy,* but when tested at audible frequencies are found to resist motion in both directions, and so give good damping. In most materials the friction may be designated as internal friction; in other materials rubbing friction is obtained, where different surfaces of the material rub together or where fibres rub together.

Some attempts to use sound deadening treatments have proved disappointing. The failure of the treatment to give the desired results in at least a part of these cases has been due to the fact that a poor deadener has been used. One can not tell from the appearance of a material how effective it may be; indeed some specifications for deadeners have been set up which do not cover the essential features which must be present in a good deadener. For example, one company found a deadener which was entirely satisfactory and had a specification written which described the weight, kind of material, amount of saturation, etc. Several manufacturers made material fulfilling this specification, and materials were purchased and used but later tests showed that some of it was only an eighth as effective as the original material.

Since materials, nearly identical in appearance and similar in composition, may differ greatly in effectiveness, due to differences in manufacture or to slight differences in composition, a table showing the ratings of typical materials, such as was published last month for sound absorbing materials, would be useless. For example, the ratings of asphalt deadeners vary from less than 10 to over 100 for a given weight per unit area. However almost every manufacturer of sound deadening material is able to furnish the *Thick Plate* ratings of the materials he manufactures. These ratings permit accurate comparison of all deadeners. The method of rating will be described below.

There are cases where even a good deadener may not be effective in reducing noise. If the vibrating member is acted upon by vibratory forces such that the amplitude of vibration remains essentially constant, no matter how good a damping treatment is applied, there will obviously be no reduction in sound, for the sound pressure is determined by the amplitude of vibration. However if the vibratory force, rather than the amplitude, is constant, the amplitude of vibration and there-

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fore the resulting sound pressure, will be reduced. Usually in practical cases, vibration is somewhere between the constant-amplitude and the constant-force conditions. In other words, where the vibrating part is loosely coupled to the source of vibrations we can expect that damping materials will be effective. When a part is excited by shock, it tends to vibrate at its natural frequencies of vibration, of which there are a considerable number for almost all machine parts. Under these conditions damping material is also effective.

Under constant-force conditions of vibration, the sound radiated will be prominent when the frequency of the exciting force is equal to one of the natural frequencies of the vibrating body. In the case of a variable speed machine the exciting forces obviously occur over a range of frequencies and so there is a strong possibility that resonance will be obtained at some speed or another. Since most air-conditioning equipment is run at constant speed there is less chance of vibrations, set up by the moving parts, resonating with one of the natural frequencies of some part. Nevertheless since the sheet metal work on air conditioning equipment may be quite complicated, from a vibration standpoint, and since one installation is apt to differ from another, it may sometimes be feasible for a manufacturer to adopt a deadening treatment in preference to designing the equipment so that there will be no possibility of securing a condition of resonance in any individual unit.

The different deadeners now on the market vary considerably in their effectiveness. It has been remarked above that two materials appearing nearly identical in appearance may differ greatly in their ability to damp out vibrations. In order to compare different materials a method of test has been developed at the University of Michigan Sound Laboratories to aid manufacturers of deadeners in improving their product and to provide users of such materials a means of specifying the desired acoustic properties. This test is now used by a majority of automobile manufacturers to select deadeners for use in production.

The test may be described briefly as follows. The sample to be measured is applied to a specially prepared test plate, which is suspended on a hook passing through a nodal line on the plate. The plate is struck and the time for a given percentage decay is measured by means of an oscilloscope and moving film camera. The test plate is ground and suspended so as to have minimum damping, so whatever damping is secured is due almost entirely to the material itself and is not inherent in the set-up. The frequency selected for the test is 160 cycles per second; this was chosen because the most prominent noise components in automobiles lie in the range from 100 to 200 cycles. Tests can be made at other frequencies also, but it has been found that any material which proves effective at this frequency will be more than satisfactory for higher frequencies.

The rating assigned to a sample is equal to the number of seconds required for the sound from the test plate to decay a definite[1] percentage. This method of rating a material obviously assigns a small number to a good material and a large number to a poor material. Deadening materials on the market vary in ratings from 170, for a very poor deadening felt, to less than one, for some of the extremely effective treatments for automobile floors.

The test plates used for the tests are one-quarter inch in thickness, so the test is useful for measuring extremely effective deadeners. Some deadening materials have been developed which make even the thick test plates sound more *dead* than a soft wood board when struck. Oscillograms showing the decay of vibrations in the test plate when covered with a very good and an exceptionally good deadener are reproduced in Fig. 4. A similar oscillogram taken with a bare plate and at the same film speed would be over 15 ft. long. The use of laboratory tests of deadeners has resulted in a very great improvement in deadeners during the last three or four years.

Damping action can also be secured by the rubbing action of two metal surfaces against each other. A housing made of two thicknesses of sheet metal spot welded together will be quite dead. The use of slip rings in gears to prevent their ringing has been found effective in some cases.

Isolation of Vibrations

A vibrating body is a poor radiator of sound if its dimensions are small in comparison with the wavelength of the sound being radiated. The wavelength, expressed in feet, of sound having a frequency f is equal to 1100/f. It is obvious then that if vibrations are confined to parts having small dimensions, the sound level will be lessened. The function of such devices as springs and rubber mountings is to prevent the transmission of vibrations into bodies which are good radiators of sound.

The design of a flexible mounting must take into account the frequency of the vibrations to be isolated, for it is entirely possible for a flexible mounting to increase the noise over what it would be if a rigid mounting were used. This of course occurs when one of the natural frequencies of vibration of the machine on the flexible mountings is equal to one of the exciting frequencies.

Rubber mountings have the advantage of reducing excessive vibrations which occur under the resonance condition mentioned above. This is especially of value in a variable speed machine, or in the case of the stopping of any machine. When a machine is stopping it will of necessity pass through the speed which resonates with the natural frequency of the machine on its flexible mountings and in some cases provisions need to be made to limit the resulting vibrations, even though they are only transitory. On starting, the machine will of course also pass through this critical speed, but usually the acceleration is sufficient to prevent the building up of a large amplitude. Rubber mountings will usually provide sufficient damping to prevent excessive amplitudes at resonance, but will be less effective than steel springs at frequencies well above the resonant frequency.

In designing flexible mountings it should be remembered that the equations ordinarily used are derived on

[1]For convenience in measuring the oscillograms and applying a correction for the small differences in individual test plates, the rating is given as the time to decay 95 decibels, which corresponds to an amplitude ratio of 1: 1/56200.

the assumption that the part suspended and the base are mathematically rigid. This of course is only an approximation; any metal part has natural frequencies of vibration of its own and in most actual machines where weight is kept at a minimum there is a possibility that a natural frequency may lie in the audible range. Under this condition, a flexible mounting may not prevent the transmission of vibration of a frequency which, the mathematical analysis seems to indicate, should be attenuated greatly. In such a case, the solution of the problem lies in locating the flexible mountings at a nodal line of the vibrating part. In one machine the writer was called upon to quiet, it was found that the springs used to suspend the mechanism from the frame conducted high frequency vibrations. Although the frequency of vibration of the suspended part was only about three cycles per second, the springs themselves transmitted some high pitched notes, due to longitudinal vibration through them. In order to prevent this transmission it was necessary to mount the springs themselves on rubber.

In case there are two or more paths for vibration to travel from the source to a possible sound radiating surface it is necessary to prevent transmission over each of these paths; if one path is neglected, the treatment will be quite ineffective. In this connection it might be stated that under almost all conditions met in practice, belts are good isolators. Some of the flexible couplings on the market are also very effective in reducing noise transmission. Ordinary flexible conduit as used for motor leads may be a source of trouble unless the ends are properly terminated. Metallic tubing when coiled will attenuate vibration if the tubing is terminated at a part having sufficiently great mass. In order to prevent the transmission of *clicks* it may be necessary to use two coils of tubing with a weight between them.

Reduction of Sound at Source

In many mechanisms, such as motors, compressors, gear units, bearings, it is frequently uneconomical to attempt to reduce sound at the source, for the remedy for the noise is apt to call for reduced tolerances or for additional manufacturing operations, which will increase costs. However, in some cases a change in the shape of some part may be made which will greatly reduce one of the noise components, or it may be found that some of the manufacturing tolerances in use are closer than is necessary and that savings can be made, by increasing these, sufficient to justify the establishment of a very close tolerance at a critical location.

In cases where there is a considerable variation in noise among production units, that is, in cases where some tone will be present in some units and absent in others, the cause of the noise is apt to be due to resonance in one of the machine parts. If such is the case, the unwanted tone can be tuned in and out by varying the speed of the machine over a limited range. In case the machine is powered by an induction motor, the speed may be changed for the test by operating it from a variable frequency alternator. In one of the noise problems brought to the writer, it was found that the cause of rejection of a large percentage of electric motors used on a compressor was due to a tone of frequency 960 cycles per second. The rejected motors were quiet when used on other machines, but on certain machines only carefully selected motors were satisfactory. It was found that the fans which were direct connected to the motor shaft had a resonant frequency at or near 960 cycles (a frequency which appears in all single phase, 60 cycle, induction motors). Merely by changing the thickness, by one gauge size, of the sheet metal from which the fans were punched no further troubles of this sort were experienced and rejections due to noise were practically eliminated.

Although often talked about, the method of reducing noise by changing the frequency of the predominant noise component at the source in order to take advantage of the variation of sensitivity of the ear with frequency, can in practice be used only rarely, for usually a change of this sort decreases efficiency or changes some other operating characteristic. One of the applications where such a change has proved beneficial, however, is in the design of propeller type fans. The noise spectrum of the usual fan of this type with symmetrical blades, symmetrically placed, consists of the fundamental tone having a frequency equal to the product of the number of blades by the speed in revolutions per second and harmonics of two, three, four, and higher integral multipliers of the fundamental plus some unpitched noise distributed more or less uniformly over the audible frequency range. Usually, but not always, the loudest component is the fundamental or the second harmonic; the loudness of the higher harmonics decreasing in magnitude. By introducing dissymmetry in the design of the fan, the fundamental frequency is reduced to a value numerically equal to the revolutions per second. Although the number of harmonics are very likely to be increased by the change, the loudness may be decreased for the loudness of a noise is largely determined by the loudness of the loudest component. Although the actual sound pressure produced by the fan may not be reduced by the change, the frequency of the fundamental is reduced by a ratio of one divided by the number of blades. If the frequency of the original fundamental was about 500 cycles per second or less, this change in frequency will give an appreciable reduction in loudness due to the difference in the sensitivity of the ear for sounds of different frequencies.

Solving a Quieting Problem

It is obvious that each noise problem requires a special treatment. The following outline is given with the hope that it may prove helpful, to a slight extent at least, in solving a specific problem even though it is necessary for the purposes of this paper to give the discussion in general terms.

1. Analysis of the noise.

   Make frequency analysis by a noise analyzer. Locate points in operating cycle where clicks or other intermittent noises occur, by means of oscillographic equipment.

2. Determine cause of each of the loudest of the noise components by use of above data.

   Reduce noise at source if practical.

3. Prevent transmission of sound from the source to possible radiating surfaces.
   Materials such as springs or rubber isolators are suitable. Avoid materials with supposed dual function of isolating and damping.

4. Apply damping materials to any surface which radiates sound. This material will be effective whenever the radiating surface is not too closely coupled to the source of vibrations. Any condition of resonance offers prima facie evidence that damping will be beneficial.

5. Absorb air-borne sounds with sound absorbing material.
   Apply where sounds are loudest.
   Prevent passage of sound through ducts or other passages.

In working on noise problems it is well to keep in mind an important characteristic of the human ear, that is, the manner in which loudness values are added. The ear adds sounds in a rather complex manner; the simplest mathematical representation that can be made is that the sounds are added logarithmically, but this is only a very rough approximation.

At first thought it would seem that two machines, of equal loudness, when operated together would have twice the loudness of one of the machines alone. This, however, is far from true; if each of the machines has a loudness of 10,000 units, the two operating together will have a loudness of only 12,600. By listening to one, then two, similar machines, the reader can demonstrate to his own satisfaction that two machines are not twice as loud as one. If we have a machine of loudness 10,000 units whose noise is made up of five equally loud components, it would seem as if the loudness should be reduced by 20% if one of the components was completely eliminated. Actually, however, the loudness would be reduced only 7%. However if each of the five components were reduced 20%, the loudness of the machine would be reduced by 24%. These figures may appear to be peculiar but they are not due to any academic desire to use a queer form of mathematics; they are due to the action of the average human ear and it has been necessary to adopt the type of mathematics which will fit the performance of that organ.

The characteristic of the ear described above demonstrates the advantage of making precise noise measurements under carefully controlled conditions. It is perfectly true that a noise reduction in any mechanical device is valueless unless the noise reduction is sufficiently great to be noticeable by ear, but it can not be reasoned from this that there is no advantage in using careful noise measurements under the assumption that any noise reduction is worthless unless it can be noticed by ear. After a careful study of the noise of a machine, whereby certain definite changes in the machine are found to give a noteworthy noise reduction and so are recommended for production, the client for whom the work is done is apt to say "We have tried all those ideas and none of them did any good." This may be quite true, for each one of the changes by itself might not reduce the loudness sufficiently to be noticeable by ear, yet the combined effect would be surprisingly good.

Bureau of Standards Develops an Improved Hygrometer

The wet and dry bulb psychrometer and hair-type hygrometer have long been used for determining the moisture content or relative humidity of air. There are, however, many possible applications in which these types of instruments have not been suitable. This is especially the case in measuring upper-air humidities by means of the radio sonde (meteorograph), a small radio transmitter carried aloft by a free balloon which sends back signals which represent altitude, temperature, and humidity. Such an instrument ascending rapidly encounters very large and abrupt humidity changes which occur too rapidly for the psychrometer or hair hygrometer to follow completely. Furthermore, these types of humidity indicators do not lend themselves readily to graphical recording or registering of humidity remote from the point of measurement, they are comparatively large, and do not function well at very low temperatures.

A new type of electric hygrometer has recently been developed at the National Bureau of Standards which has proven superior to other types for radio-sonde use because of its rapid response and ability to function at low temperatures. It may also be used for making and recording humidity reading when the humidity unit is remote from the point of indication. As it is comparatively small it may be used for measuring humidities in confined spaces.

Although the device seems simple, it has required two years to bring it to the present stage of development where it gives results accurate to within 2 or 3 per cent.

It consists of two fine palladium wires spirally wound about 1/64-inch apart, 20 turns per inch, on a thin-wall aluminum tube which has a thin coating of polystyrene resin on it. This resin is one of the best known water-resistant substances as well as an excellent electrical insulator. The wound unit is then covered with a very thin film of partially hydrolyzed polyvinyl acetate with the addition of a small amount of lithium chloride. The latter takes up water very rapidly. With such a device the electrical resistance of the film between the two spiral coils is dependent upon the humidity of the air in contact with the film. The variations in resistance may change the audio note which the radio sonde transmits or it may be made to operate a direct-reading ohmmeter with the resistance scale marked in terms of per cent relative humidity.—*Francis W. Dunmore, National Bureau of Standards, Washington, D. C.*

Fig. 1. An air conditioner has been installed in this tractor at the Dow plant which hauls a carry-all and shoves a bulldozer. The unit handles an average of 130 tons of coal per hour.

Fire Hazard Reduced in Piling Coal

A THOUSAND tons of coal a day are used by The Dow Chemical Company. And when any one industry's coal requirements reach figures as large as that, several major problems of handling and storage present themselves. For three years this Midland, Michigan, company's revolutionary coal handling and storage methods have been attracting nation-wide attention. Wherever coal is used in huge quantities, these methods are either being studied or have already been adopted.

Until 1937, the coal was stored in conical piles of eight to twelve thousand tons each. Temperatures were taken weekly and an average rise in temperature of 0.5F per day was noted. This rise is caused by the chemical reaction between the oxygen in the air and the constituents of coal.

In the past, coal was dumped directly from lake boats. Slack was piled loosely just as it fell, allowing free entry to air. In such a pile, natural classification soon caused a separation of fine and coarse particles, the former being more firmly compacted than the larger pieces. When a second load was piled on the first, the same thing happened, likewise with each succeeding load. A glance at the cross section of the conical pile in Fig. 2 shows the oblique stratification caused by this method. Between each fine layer lies a coarse one, which being loosely compacted, constitutes a sort of flue or series of them. In case of fire these operate in much the same fashion as their counterparts in chimneys. In other words, the warm air rising through them allows cold air to filter through the coal at the bottom of the pile and feed the flames.

It was often found necessary to re-pile the coal in order to eliminate this fire hazard. This involved expense, but the cost was minor compared to that sustained when fires started, as anyone who has had the experience of subduing a blaze in a large coal pile can testify.

Until three years ago, however, the conical method of piling still seemed the most economical, but when at that time it became necessary to carry a larger stock for a longer period of time, various other possibilities in storage procedure were investigated. Coal is now stored in horizontal rather than oblique strata. This eliminates the formation of flues and reduces the fire hazard. There is little need to fear spontaneous combustion since coal is packed so tightly that little oxygen can filter in. In the three years that Dow has been storing its coal thus, no rises in temperature have been noted, even after 18 months of continuous storage.

Since this method of piling coal gives an extremely compact flat plateau, it is necessary to round off the top to insure proper drainage. With the correct pitch it is possible to achieve this with no appreciable increase in the moisture content.

Fig. 2. Stacking coal in horizontal rather than conical piles eliminates the formation of flues and reduces the fire hazard. When no oxygen filters in, spontaneous combustion is eliminated. Coal stored in horizontal piles for 18 months showed no rise in temperature.

1 A FATHER and four sons comprise The G. X. Mathews Company which during the past thirty years has built housing projects in New York's Sunnyside, Woodside, and Ridgewood. These modern 2-family dwellings are part of a new five block Mathews development in Elmhurst where block heating is proving advantageous to both owners and tenants.

Block Heating for Two-Family Houses

By CLIFFORD STROCK†

How a real estate developer is using block heating for rows of two-family houses in a New York project, thereby building up a selling point, making a moderate profit, and simplifying his own and tenants' problems. Four such plants are in operation with a fifth under construction.

BLOCK heating, with four central heating plants, each serving the houses in its block with both heat and hot water has been adopted most successfully in a real estate development in Elmhurst, N. Y., by The G. X. Mathews Company, a progressive and alert real estate developer and builder of Woodside, N. Y., who has been active in Long Island developments for over thirty years. The houses heated by these central plants are all of the connected two family type. The plants are managed under an arrangement whereby the developer continues to operate the plant after the buildings are sold, charging the house owners a flat yearly rate for the heat and hot water, payable quarterly.

The plants are at present in operation in three adjacent blocks and a fourth is now under construction in a triangular district of Elmhurst, near Woodside, bounded by Grand Ave., 79th Ave., and Calamus Ave., as shown on the accompanying sketch. Both one- and two-family houses are erected on the 4 blocks included in this 13 acre area, the two-family houses being attached row houses. The houses, with their accompanying plots, are sold for $8000 on an arrangement whereby the buyer pays $2000 down, while the developer holds a $1500 second mortgage and a $4500 first mortgage. According to the Mathews Co., buyers prefer this arrangement when purchasing a two-family house to a house financed under the FHA plan. Two-family houses are particularly popular in the borough of Queens in which the development is located, especially among those in the relatively low income brackets. The houses are bought not only to provide housing for the buyer but to obtain the extra dwelling unit which can be rented at prices ranging from $42 to $48 per month, sufficient to reduce the owner's payments sharply. In fact, the developer can show that a buyer with one tenant can live rent free after the third year—in other words, after the second mortgage is paid off. Quite a number, also, are bought by individuals who buy the houses solely as an investment and rent both upper and lower floors.

Prior to the depression it was customary, in two-family houses, in the Queens district, to have two heating plants for the two floors, the tenant and owner each taking care of his own plant. With the increasing popularity of the oil burner, however, this gradually changed until a large number of two-family houses now have a single plant fired by oil (and in some cases gas) which, being completely automatic, involves no problem of tenant care of the heating plant and the owner is free to leave the house for extended periods at any time. This is especially advantageous in the case of two tenants in a house with absentee ownership. Even a central oil burning plant requires some attention, and consequently the plan adopted in the Mathews development has advantages for absentee owners.

The accompanying tabulation lists the number of houses in the different blocks, while the plot plan shows the location of the heating plants. The houses, which are of solid brick, have heated garages in the basement which are entered from the rear through a community court. Each house has a concrete porch in the rear.

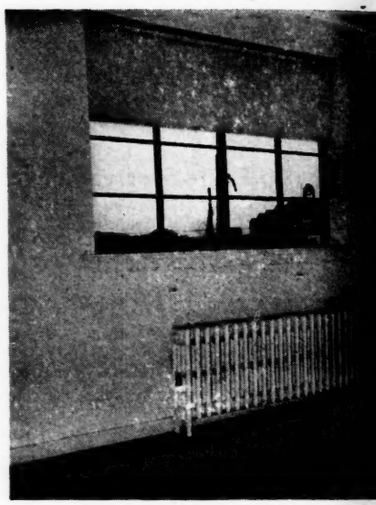
†Associate Editor, HEATING & VENTILATING.

BLOCK HEATING FOR PRIVATE HOUSING

2 TWO WATER-TUBE BOILERS, with oil burners using No. 6 fuel, in the boiler room of Block D. To accommodate the boilers, the cellars are excavated to a 13-foot depth. A concrete-enclosed room adjacent to the boiler plant houses the fuel-oil storage tanks. Instantaneous water heaters furnish the domestic hot water through mains which parallel the steam piping and condensate returns. Each house has its own flue so that tenants can, if they wish, install their own boiler with little trouble. Mains are laid out with unions in each cellar to facilitate cutting out from the system.

3 ONE BOILER supplies heat to Block A, shown in background; one also serves Block B. The plants in Blocks D and E have two boilers each. Foundations for part of Block E appear in the foreground. Some houses are sold to owners who rent one unit; others are absentee owners.

4 AT PRESENT TIME Block E is partially completed as shown above. The boiler plant is housed in the building at extreme left. The slightly rolling terrain has made it possible to return condensate back to the central steam boiler plants by gravity. The steam is not metered, thus eliminating meter cost, meter reading, and billing.

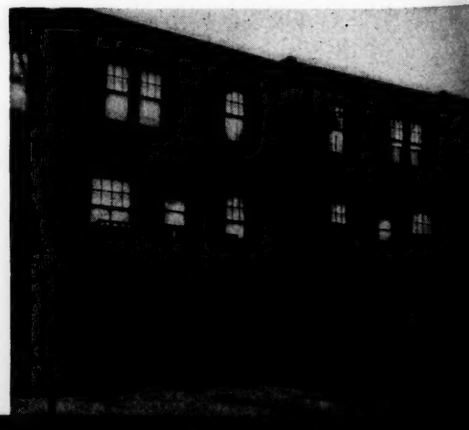


5 HEATING SYSTEM in each building is one-pipe steam with radiators in the open as shown above, a view in one of the living rooms on the second floor. If buyer desires, he can install his own boiler; a chimney has been provided.

6 THE BOILER PLANT for Block D is located in the cellar of this corner building. The chimney extends but slightly above the roof of the houses. An advantage of this block heating to the tenants is that the smoke nuisance is greatly minimized. Owner makes moderate profit. Only one of houses sold has own plant.

7 SHOWN HERE is the stack for the boiler plant of Block A, the first of these installations. Later plants have brick chimneys as shown in Fig. 6. One garage is provided for each house. An arrangement is made with buyers under which the owner has the right to run the heating mains through the basement for a period of years.

8 BUYERS of two-family houses such a these who are purchasing as an inves ment, should be required to pay only 10 p cent down under FHA regulations instead 20 percent, as is done with one-family hous according to C. X. Mathews, one of the fo sons, who points out that two-family hous are a better risk because of the extra incom



Heating Plant

In each case the heating plant is located in one of the basements of a two-family house in a 13 ft. deep cellar excavated for that purpose. Each boiler room contains either one or two water-tube steel boilers of the developer's own manufacture, each with an average capacity of 12,000 sq. ft. of steam radiator actual output. These are fired with oil burners and supply steam, as well as hot water, for practically all of the two-family houses in each block. The oil tanks have a capacity from 3000 to 6000 gallons, depending upon the block, and are located in a concrete enclosed portion of the cellar adjacent to the boiler room.

Each house contains approximately 250 sq. ft. of steam radiator surface, connected by a one-pipe heating system to the steam main in the basement. In case the owner at any time should decide to cut loose from the central heating plant and install his own boiler, provisions are made for breaking the house main and the house return at unions. Each house is provided with a flue, in addition, for use if the owner installs a boiler. A separate agreement is made with buyers, allowing the developer to use the cellar for passage of his steam, hot water and other mains, the agreement being in force until such time as the plant may be abandoned. Steam and return mains run from the boiler straight through the walls of adjoining basements with the condensate returning by gravity. The only exception to this is a small section of houses where the condensate flows to waste, but this will be changed in the near future.

In order to eliminate the cost of steam meters and the complications of meter readings and billings, the operator charges a flat yearly rate of $150 per year for each house—that is, $75 for each dwelling unit. This is the rate at present in force, but is subject to change depending upon fluctuations in fuel cost.

With the load at present connected to the boiler each boiler is carrying 75% of its rated load. Instantaneous hot water heaters are used in the more recent blocks.

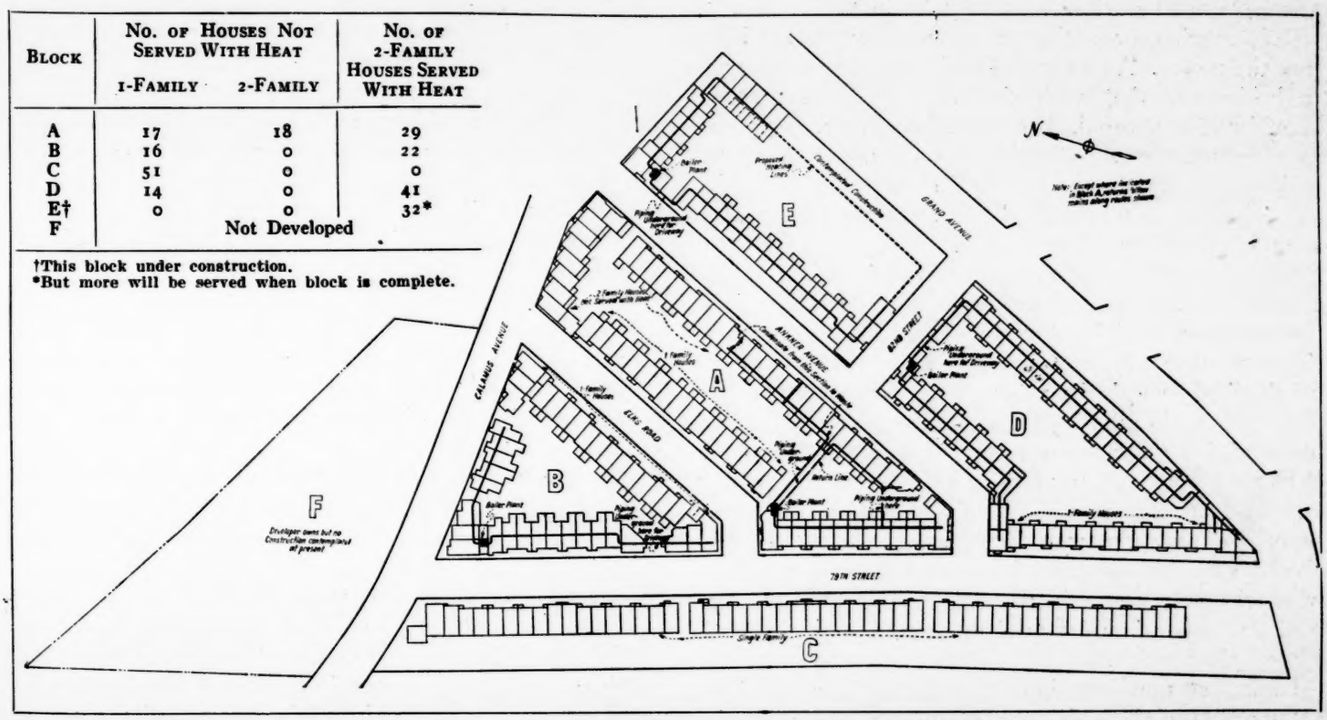
Originally, the developer had in mind a large central heating plant to serve the whole four blocks but since this involved crossing streets with steam mains it would have meant the obtaining of a franchise from the State to operate as a public utility, a complication with which developer did not care to become involved. Of the two-family houses in the three blocks already in operation, about 20 have been sold and all but one of those sold are using the heating service offered.

Advantages

The advantages of the central heating plant to the builder include those of making a moderate profit on the heating service; it provides a good selling point, and it simplifies the owner's supervisory and maintenance problems in connection with houses which are still unsold. To the tenant the advantages include that of freedom on the part of both owner and tenant from heating problems; there are no maintenance men entering the building to service the heating equipment, there is no dirt or dust from an individual heating plant, and the cost is less than with individual plants. In general, to date the developer's profit in operating the plant has consisted of the money made in buying fuel in wholesale quantities, the use of heavy and cheaper oil than the tenant could feasibly burn, and from the somewhat higher operating efficiencies of the central plant.

Block	No. of Houses Not Served With Heat		No. of 2-Family Houses Served With Heat
	1-Family	2-Family	
A	17	18	29
B	16	0	22
C	51	0	0
D	14	0	41
E†	0	0	32*
F	Not Developed		

†This block under construction.
*But more will be served when block is complete.



9 THE 13-ACRE PLOT comprising the Mathews development in Elmhurst, showing the location of boiler plants and heating mains. Areas inside each block are used for driveways from the street and into the garages, with the space between the driveways devoted to lawns and trees. At the present time, the project contains 240 houses of which 142 are two-family houses. Of these 142 two-family houses, 124 are served with central heat. For the central heating, the owner pays an average of $150 per year for the whole house (two dwelling units). This rate depends on fuel costs.

Safe Operation and Installation of Automatic Stokers†

By H. B. EVANS‡

THE control system is of primary importance to the safe operation of the stoker. This usually consists of a linestarter or magnetic switch to start and stop the motor, together with a limit regulator to stop the stoker when the steam pressure or water temperature reaches a pre-determined setting. Needless to say, these controls must be properly installed and of a type approved by the Underwriters' Laboratories. The limit control must be installed where it is directly subjected to the boiler water temperature or steam pressure, as the case may be. Valves should not be installed between the limit regulator and boiler unless the valve can be locked to prevent tampering by unauthorized parties. One exception to this rule is the case where one limit regulator is installed in the steam header. It is often not practical to operate a battery of steam boilers with individual controls for each boiler.

Numerous types of thermostats and temperature control systems are available but, in general, do not affect the operation of the stoker from the safety standpoint. All electrical motors should have some form of electrical overload device. This may be in the form of a circuit breaker or a thermal overload protector built into the motor. A clever mechanic may find some way to bridge out the overload device, but this practice should not be allowed. If the overload device is thrown out, it is usually an indication that the motor or wiring is defective, or that the electrical supply voltage at the motor is not up to standard. In any case, the trouble should be corrected immediately.

One piece of control equipment which should be included on every automatically fired steam boiler is a low water cut-off. This device will stop the burner when the water drops below a safe level. The low water cut-off should be checked periodically to make certain it is in proper working order. A low water cut-off, properly installed, has a blow-off pipe on the bottom of the float chamber. Opening the valve in this line will blow out any sediment that may have collected and, at the same time, dropping the water line in the float chamber should stop the motor. If the burner does not stop when the water level in the float chamber drops, immediate steps should be taken to find out why and correct the trouble.

Under most modern boilers, a stoker is installed as a "floor setting." This type of installation is one in which the stoker retort is set approximately level with the normal grate line of the boiler. Such an installation is relatively simple to make, and does not require as much skill as some of the more complicated pit settings where the stoker is set in a refractory-lined furnace below the usual grate line.

The purpose of pitting a stoker is to obtain additional furnace volume for more efficient combustion. It is not necessary to pit the stoker in order to protect the boiler from the fire because the stress on the fire-box section of the boiler is about the same whether the stoker is close to the crown or down in a deep pit. This may seem a bit paradoxical as, at first thought, it would appear that the closer the fire were to the boiler, the more intense the heat would be on the boiler surfaces.

Flame impingement on the crown sheets is not a problem with a coal fire as it may be with oil or gas burners. Due to the constantly changing nature of the fuel bed, its flame is never concentrated in one location for any length of time. As further proof for this condition, we have the many hundreds of stokers which have been installed directly in the firing tubes of Scotch marine boilers. In most of these cases, the fuel bed almost touches the crown of the firing tube. This type of installation may leave much to be desired from the standpoint of combustion efficiency but has proven satisfactory from the maintenance standpoint, proving that the distance from the fuel bed to the boiler has little effect on the life of the boiler.

When a stoker is installed in a pit setting under a fire-box or water leg boiler, consideration must be given to protecting the bottom of the water leg from possible overheating. Due to the fact that water circulation is apt to be poor at this point, and any dirt or sediment in the water will settle out there, it is standard practice to protect the lowest section from the direct heat of the fire.

Occasionally, we find a condition where the owner of a stoker which has been installed to burn bituminous coal wishes to change to rice or buckwheat anthracite. Unless the stoker has been designed to burn anthracite, certain minor alterations must be made before changing from bituminous to anthracite coal. Before making this change in fuel, the owner should check with the stoker dealer to make certain the stoker has been properly set to burn anthracite. This is a condition peculiar to this section of the country, and in the early days of the stoker industry, caused no small amount of worry to stoker dealers and owners until the proper methods of handling were developed.

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†Abstracted from a paper presented before the 11th annual convention of the Greater New York Safety Council.

‡Sales Manager, Eastern Div., The Iron Fireman Corp., New York.

EDITORIALS

Association Research

Probably most people do not realize fully how much of an expenditure of time and money goes into the standardization and research programs carried on by some of the manufacturer trade associations. Probably also few are aware of how extensive these activities are. With many associations, some of which have no more than a dozen members, the total number of research and standardization projects underway is so difficult to determine that we know of no trustworthy single listing which includes all of them. It is safe to say that there is scarcely a manufacturer group in the whole industry whose organization does not include a committee working on some phase of standardization or on some kind of research project.

In the absence of a comprehensive listing one way to keep in touch with what some of these associations are doing along these lines is through the news of the beginning of these projects and of the final adoption of standards or codes which usually marks their close. Within the last few weeks two of these events have come to attention.

One is the newly published standard of the Stoker Manufacturers Association setting forth a simple rule for determining the height of the boiler above a bituminous stoker. This is the result of a study by an Association committee which involved a field survey of results obtained where bituminous stokers are used. The standard makes the height of setting increase as the rate of burning coal increases. The published standard is in the form of a simple graph showing two straight line relations between setting height and burning rates. For small stokers with a burning rate of 20 to 100 lb. per hr. a minimum setting height of 18 in. at 20 lb. is indicated with an increase of an inch in setting height for each 9 lb. increase in burning rate up to 100 lb. per hr. This fixes the setting height at 27 in. at 100 lb. per hr. From 100 to 1200 lb. per hr. the setting height increases three inches for each increase of 100 lb. in the burning rate. The standard as published certainly has the merit of simplicity. When fully substantiated by added field experience such a standard should prove most useful in meeting a problem which has some public interest generally because of its close relation to smoke prevention.

A second recent announcement of an association activity is that the organized manufacturers of cast iron boilers and radiators are undertaking a three-year research program to take into account the recent trend toward construction of small detached residences of low cost. Presumably a search will be made to find suitable means of using cast iron boilers and radiators as devices for heating small residences at low enough first and operating cost to let them fight off any tendency of the warm air furnace to pre-empt this building type. Success in such attempts would do much to determine the course of future events in heating practice in the slowly evolving low-cost house construction.

In these two announcements we have good examples of trade association ventures which are typical of dozens of others, some small and some great, some well publicized and some but little known, but most of which are matters of much greater possible import than is usually suspected. The great increase of activity in these aspects of the work of engineers is one of the outstanding developments of recent years. Much has come of these cooperative projects already and there is basis for the belief that these joint efforts may be expected to produce still more notable results as time goes on.

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Estimating Sun Loads

Ever since it has been necessary to prepare estimates of the heat load which must be overcome in summer in order to maintain cool air inside building structures, the problem of the load due to the sun heat has been with us. Early it became apparent that this sun heat might on occasion become the largest component of the whole cooling load. Early experience also indicated that the load due to sun heat was extremely variable from day to day and even from hour to hour. How to estimate the effect with sufficient accuracy for practical purposes and with only a reasonable amount of work remained as an enigma.

Before long the instantaneous load due to exposure of glass windows to direct rays of the sun could be estimated for all hours of the day and figures were evolved for reductions due to shading window openings in various ways.

There still remained the effect of the sun in heating up the walls and roofs and thus causing heat to find its way through these barriers and eventually to the inside air, thus becoming a part of the load. It has long been known that the progress of this heat through the wall and roof barriers is slow when the constructions are built up of materials having considerable heat capacity. Still there appeared no generally acceptable method of estimating the load with specific constructions at various hours of the day. In the March and April issues of HEATING & VENTILATING, Mackey and Wright outlined a procedure whereby the whole quantity of heat passing through a wall can be estimated with reasonable accuracy on a typical July day when the sun is shining. Their analysis indicates the necessity for long calculations in order to reduce the theory to a workable basis but in this issue they present tabular data whereby their method may be simply and quickly applied to some typical walls and roofs. Thus there is generally available to estimaters for the first time a simple method of approximating the heat load due to sunlit walls and roofs. We believe that this represents a distinct gain toward simplification of procedure in estimating cooling loads.

ABSTRACTS of Current Papers, Books and Pamphlets

Refrigerant Control Handbook

The operation of the refrigerant control system of a refrigeration machine is less understood by servicemen than perhaps any other part. Because of this lack of knowledge, a large amount of time is spent unnecessarily in adjusting and replacing these parts in an attempt to correct operating difficulties. Refrigerant control manufacturers have long recognized this point and have done much in an attempt to educate servicemen as to the correct working of these parts. This handbook is the latest and one of the most outstanding contributions to this effort.

As is to be expected, the greater portion of the book is devoted to a description of the control of refrigerant in the system. Some treatment is given, however, to general refrigeration and to simplified definitions of the terms commonly used. A considerable amount of space is devoted to trouble locating procedure.

A list of the chapter headings follows: Practical definitions of air conditioning and refrigeration terms; tables and equivalents; the refrigerating system; thermostatic expansion valves; ammonia thermostatic expansion valves; service manual; pressure drop; liquid flood back, and magnetic stop valves. [*"Handbook of Automatic Refrigerant Control." Published by the Alco Valve Company, 2628 Big Bend Boulevard, St. Louis, Mo. Heavy paper cover; 5½ x 8 in.; 68 pages and a catalog section. Price, 50 cents. Also available free through Alco distributors to purchasers of Alco valves.*]

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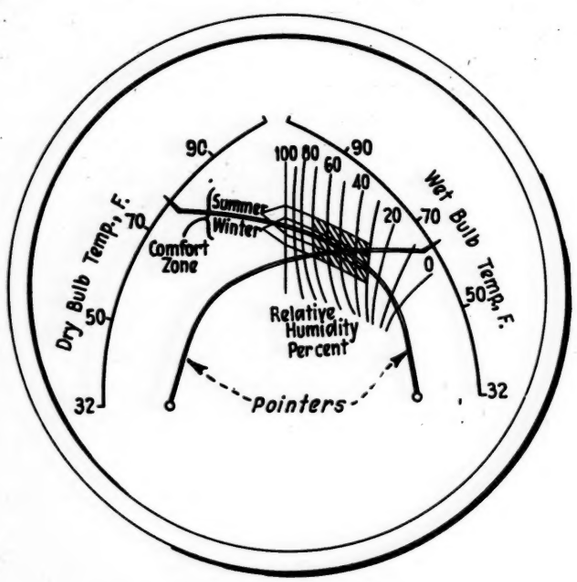
New Psychrometer for Air Conditioning

The new French psychrometer for air conditioning called *Psychrabac* (see figure) makes possible the simultaneous reading of dry bulb temperature, wet bulb temperature, relative humidity, heat capacity of dry and humid air and the position of actual air data in regard to the requirements of summer and winter comfort zone. If necessary the psychrometer can also be provided with scales for reading the dewpoint, absolute humidity, partial pressure of water vapor, effective temperature and like terms; thus, rapid determination whether or not the air in comfort zone is possible.



An Instrument for the simultaneous reading of air conditions.

All these readings are effected by means of two independent curved pointers collaborating with special scales and traced curves. The pointers are actuated by means of two bimetal thermometers of very small thermal inertia. One of these thermometers is dry, another is wet. The directions of rotation of the pointers are opposite and the point of their momentary intersection represents the state of the air. The casing of the psychrometer contains a distilled water holder for wet thermometer and a small electric ventilator.

Besides the above mentioned useful data, other air characteristics can also be introduced on the scales, namely, evaporation capacity (difference between actual and maximum humidity content of the air) in the cases when the dry bulb temperature is kept constant, the cooling power (corresponding to the last mentioned evaporation capacity), maximum saturation pressure, so-called "physiologic humidity," "physiologic humidity deficit," weight of actual air containing one pound of dry air, etc.

[*"New Psychrometer," by P. Mondet, in Chaleur et Industrie, v. 20, 1939, page 425. Published by P. Couturaud, 5, rue Michel Ange, Paris, 16e, France. Price 10 Fr. or 30 cents. Abstracted by Dr. Stephen Zamenhof.*]

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Heat Transmission of Hot Water Radiators

In the measurement or testing of the heat transmission of water radiators in the stationary stand of equilibrium (when water flows through the radiator) the accuracy of the measurement is highly influenced by many factors:

1. The accuracy of temperature measurements of incoming and outgoing water. This measurement is not free from errors.

2. The convection phenomena of the air in the vicinity of the radiator; the presence of the testing person near the radiator introduces error in the measurements.

3. The accuracy of measurement of mean environment temperature.

4. Whether the surrounding air is or is not in the state of thermal equilibrium of the moment of measurement. To obtain the thermal equilibrium, a period of several days is necessary.

To obviate these above difficulties, the author proposes the testing and measuring of these radiators in non-stationary stand of cooling down. If after the measurement of temperatures, the specific phenomena of heat transmission from water to iron and from iron

to air is taken into account, it is possible to obtain accurate results without great influence from the four factors mentioned above. The heat transmission coefficient thus can be calculated in relation to the temperature drop between radiator surface and environment. If the relation between heat transmission coefficient and the difference of mean air temperature and mean water temperature is to be established, it is necessary to consider the heat transmission between water and iron. Theoretical considerations show that this heat transmission coefficient in the standard radiators amounts to 88 B.t.u. per sq. ft. per hr. in the case of stationary water and to 50 B.t.u. per sq. ft. per hr. in the case of laminar water flow at very low velocity.

By means of this coefficient of heat transmission it is possible to calculate the coefficient of heat emission with an accuracy of 2%; the error in this case of measurements with stationary equilibrium stand would be much greater (3 to 4%).

[*"Heat Transmission in the Radiators of Collective Heating Plants," by E. F. M. van der Held and H. J. Hamaker in Gesundheits-Ingenieur, March, 1939, page 149. Published by Verlag R. Oldenbourg, Munchen 1, Brieffach 31, price 0.75 RM, approximately 30 cents. Abstracted by Dr. Stephen Zamenhof.*]

BRIEF REVIEWS

Boilers. Contains the IBR ratings approved by the Institute of Boiler and Radiator Manufacturers for the various manufacturers. Ratings cover boilers up to 20 in. grate width. [*"IBR Ratings for Cast Iron Boilers." Published by the Institute of Boiler & Radiator Mfrs., 60 East 42nd Street, New York, N. Y. Paper cover; 5½ x 8½ in.; 24 pages. Available on request.*]

Refrigerant Lines. Newly calculated tables of pressure drop of methyl chloride in pipe lines based on recently published thermodynamic data of Tanner, Benning and Mathewson, and viscosity studies of Benning and Markwood. Data is given for frictional pressure drop in pounds per square inch per 100 feet in both vapor suction and liquid lines of smooth brass or copper carrying 1/20 to 30 tons refrigeration. No allowance is made for oil. Supplementary information is given on the effect of varying the refrigerant liquid temperature and superheating suction gas. [*"Pressure Drop of Methyl Chloride in Pipe Lines," by H. G. Tanner and E. W. McGovern, Arctic Service News, November, 1939, published by the R. & H. Chemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Four pages, available on request.*]

Humidity. A research paper of the National Bureau of Standards which describes the development of a new type of electric hygrometer, designed particularly for the measurement of upper air humidities but also suitable for the measurement of humidities in applications where the measurements must be made rapidly or in confined space or at low temperatures. Instrument is said to be accurate to within 2 or 3%. [*"An Improved Electric Hygrometer," by Francis W. Dunmore. Research paper RP1265. Published by the National Bureau of Standards, United States Department of Commerce, 6 x 9 in.; 18 pages. Price, 5 cents. For sale by the Superintendent of Documents, Washington, D. C.*]

Directory of Service Organizations. This booklet consists of a list of the company names of some 2000 independent service organizations throughout the country. The listing is broken down by cities and states. In addition to the company name, information is included regarding each service organization indicating the kind of work done, the kind of equipment on which it is done, and the method of payment used by the organization. It is of interest to note that a large fraction of these service organizations consider themselves equipped to handle the necessary field engineering and that about a third of them consider themselves equipped to handle service work in connection with heating equipment as well as service work in connection with domestic and commercial refrigeration and summer air conditioning. [*"Independent Service Organizations in Heating, Refrigeration, Air Conditioning—A Directory, January, 1940," published by Industrial Training Institute, Inc., 2130 West Lawrence Ave., Chicago, Ill. Paper cover; 8½ x 11 in.; 219 pages. Price, $4.*]

Heat Transfer. In heat-transfer apparatus the rate of heat flow from the hot to the cold fluid is proportional to the temperature difference between the two. For design purposes, it is necessary to be able to determine the mean difference in temperature from the inlet and exit temperatures. Numerous investigators have contributed analyses of the temperature difference for exchangers with neither counter nor concurrent flow. This paper coordinates the results of previous studies on the same basis to give as complete a picture as possible of all the various arrangements of surface and flow. Shell-and-tube exchangers with any number of passes on shell side and tube side are covered as are the crossflow exchangers with different pass arrangements and with mixed and unmixed flow. The special cases of trombone coolers, pot coolers, and batch processes, not previously published, are also treated in detail. [*"Mean Temperature Difference in Design," by R. A. Bowman, A. C. Mueller, and W. M. Nagle. Paper presented at the annual meeting of the ASME, December 4-8, 1939. 12 pages. For copies, write American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y.*]

Evaporation. A simplification of the Maxwell-Stefan equation is given, for the rate of evaporation at a definite point on a liquid surface: $E = K(D_1 M_{pa1})$. This equation can be extended to cover the rate of evaporation over a finite liquid surface and can be used as a comparison of evaporating rates of liquids. The term "evaporative index" is suggested for the group $D_1 M_{pa1}$. By comparison of experimental and calculated values of the evaporative index, both for the author's data and for results reported in the literature, the practical utility of $D_1 M_{pa1}$ is demonstrated. Vapor pressure curves, covering the range from room temperature to the boiling point, are given for several liquids. [*"Evaporative Index," by George S. Gardner. Published in Industrial and Engineering Chemistry, February, 1940, pages 226 to 231. Room 706 Mills Building, Washington, D. C. Price, single issues, 75 cents.*]

RADIANT HEATING. Bulletin presents a non-technical discussion of the principles of radiant heating and reports modern practice in installing such systems. Contains information on the theory of radiant heating, thermal radiation, the application of thermal radiation to heating systems, calculations for the design of radiant heating systems, measurement of radiant heating, selection of pipe, some modern installations, and cost. This bulletin is to be recommended to all persons interested in obtaining a fundamental knowledge of this subject. [*"Wrought Iron for Radiant Heating Installations," published by the A.M. Byers Company, Pittsburgh, Pa. Paper cover; 8½ x 11 in.; 24 pages. Available on request.*]

INSULATION. This paper will be useful to writers of specifications for insulating materials to be utilized on refrigerated structures or equipment. The proper insulating material has a low thermal conductivity, is able to withstand the service conditions to which it will be subjected, is relatively impermeable to air and water vapor, and can be installed with a minimum of difficulty and expense. [*"Choice of a Low-Temperature Insulating Material," by K. M. Ritchie and C. C. Vogt. Published in Industrial and Engineering Chemistry, Room 706, Mills Building, Washington, D. C., July, 1939, pages 821 to 823. Price, single copies, 75 cents.*]

INDUSTRIAL VENTILATION. Four case studies of industrial ventilation problems and how they were solved. Problems involved removal of fumes in copper strip plant, elimination of lead contamination from air, elimination of silica hazard, and removal of benzol fumes. [*"Practical Application of Industrial Exhaust Ventilation for the Control of Occupational Exposures," by B. F. Postman, M.E. Published in the American Journal of Public Health, 50 West 50th St., New York, February, 1940. Pages 149 to 161. Price, single copies, 50 cents.*]

HOUSING. A review of the cost of the national slum clearance and the public low rent housing program. Deals primarily with the Federal Government share of the slum clearance and low-rent housing program. [*"What Does the Housing Program Cost?" Published by the United States Housing Authority, Federal Works Agency, Washington, D. C. Paper cover; 6 x 9 in.; 31 pages. Available on request.*]

MINERALS YEARBOOK. 1939 edition reviewing the mineral field during the year of 1938. Book is divided into four parts entitled as follows: survey of the mineral industries; metals; nonmetals; and mine safety. [*"Bureau of Mines Minerals Yearbook 1939." Published by the Bureau of Mines, Department of the Interior. 1447 pages. Price, $2. For sale by the Superintendent of Documents, Washington, D. C.*]

FUEL OILS. Commercial standard CS12-40 for fuel oils which was accepted by the industry as its standard for new production beginning January 5, 1940. [*"Fuel Oils (Fifth Edition) Commercial Standard CS12-40," published by the National Bureau of Standards, United States Department of Commerce, Washington, D. C. Paper cover; 6 x 9 in.; 19 pages. For sale by the Superintendent of Documents, Washington, D. C. Price, 5 cents.*]

TEMPERATURE OF INTERIOR WALL SURFACES. Hitherto the temperature of interior wall surface has been taken into account for general considerations only, and prevention of walls sweating was calculated on the basis of admissible heat transfer coefficient. In many practical cases, however, the precise knowledge of interior surface temperature seems to be necessary as the previously mentioned calculations on the basis of insulating power of the walls does not correspond to reality so that sweating effects can sometimes occur. The author has composed tables for the precise calculation of sweating effects on the interior wall surfaces. One table shows the total heat transmission coefficient without humidity exchange in the case of radiation towards the surface at room temperature and towards the cold walls. Another table shows the partial heat transmission coefficient for heat conduction and convection, as well as for radiation and humidity exchange at different relative humidities of the air. The temperature of wall surface is of special importance in the cases of panel radiation heating. The author calculates the amount of heat given off by the vertical surface of 10 sq. ft. and 76F (which represents the man-area and man-surface-temperature) by the heat conduction and convection to the air of different temperatures, and by the radiation to the wall surfaces of different temperatures. [*"The Temperature of Interior Wall Surfaces and the Insulating Efficiency of Walls," by J. S. Cammerer in the Heizung und Luftung, v. 13, page 39. Published by VDI-Verlag G.m.b.H., Berlin NW7, Dorotheenstr. 40. Price 1 RM, approximately 40 cents. Abstracted by Dr. Stephen Zamenhof.*]

CARBON MONOXIDE. 7th bulletin in a series on the detection of toxic gases in industry. This bulletin deals with the detection of carbon monoxide by a method which makes it possible to readily estimate the carbon monoxide in air down to one part in 10,000. The estimation is made by drawing samples of air through a test paper until a standard color is developed. Bulletin includes a chart of stains. [*"Carbon Monoxide, Leaflet No. 7." 9 pages with a chart in cover pocket. Published by The Dept. of Scientific and Industrial Research, British Government. Available through the British Library of Information, 50 Rockefeller Plaza, New York, N. Y. Price, 1s 6d. 45 cents.*]

DUST. A discussion of dust and air pollution with particular reference to the methods of supplying cleaned air. Contains considerable material on the electrical precipitation method of dust removal. Paper was presented before the American Management Association at the Production Conference held in Chicago, November, 1939. [*"Solving the Dust and Air Pollution Problem," by G. F. Begoon. Six pages. Available from the American Management Association, 330 West 42nd Street, New York, N. Y.*]

SHIPS. A lengthy paper on the ventilation of ships with particular reference to passenger vessels. [*"The Ventilation of Ships," by R. McDonald. Published in the Journal of the Institution of Heating and Ventilating Engineers, London. Pages 272 to 295. Address secretary, Journal of the Institution of Heating and Ventilating Engineers, 22 Russell Square, London W.C. 1, England.*]

SUN HEAT TRANSMISSION OF SINGLE WINDOWS

(Figures apply to mid-summer conditions)

PLAIN GLASS

B.T.U. TRANSMITTED INTO ROOM PER SQ. FT. OF GLASS PER HOUR

TIME OF DAY	ORDINARY VERTICAL GLASS WINDOWS FACING								HORIZONTAL SKYLIGHTS
	E	SE	S	SW	W	NW	N	NE	
6 AM	104	43					33	95	6
7	107	68					44	149	96
8	105	110						195	122
9	100	140						215	152
10	107	160	9					48	234
11	39	182	17						260
NOON		190	23	19					272
1 PM			18	21	28				230
2			8	27	104	49			220
3				106	154	91			175
4				107	178	130			119
5				96	167	150			59
6				45	104	98			9

TIME OF DAY	HEAT ABSORBING VERTICAL GLASS WINDOWS FACING								HORIZONTAL SKYLIGHTS
	E	SE	S	SW	W	NW	N	NE	
6 AM	60	25					19	75	6
7	120	68					8	115	49
8	143	86						154	96
9	133	98						170	140
10	98	99	7					38	190
11	39	60	15						220
NOON		8	15	8					230
1 PM			12	28	28				197
2			6	67	98	31			170
3				91	145	79			130
4				98	157	120			92
5				69	139	140			46
6				28	89	94			9

6 AM	104	28					28	98	19
7	107	64					9	134	88
8	105	117						205	155
9	100	154	6					91	191
10	107	84	20						230
11	39	65	30						235
NOON		38	44	23					257
1 PM			36	46	38				234
2			28	100	104	38			201
3			7	108	156	78			176
4				98	178	130			118
5				92	167	134			58
6				48	104	98			10

6 AM	60	28					18	78	6
7	120	68					9	130	48
8	143	90						178	98
9	133	98	6					182	138
10	98	99	15						177
11	39	64	28						195
NOON		39	34	18					205
1 PM			28	38	28				188
2			17	78	88	28			178
3			6	98	128	68			134
4				98	157	98			92
5				78	138	108			48
6				38	88	78			9

6 AM	104	34					15	98	14
7	107	82					5	130	82
8	105	125						165	128
9	100	138	17					68	178
10	107	137	44					15	224
11	39	114	58						248
NOON		74	71	38					268
1 PM			61	88	38				244
2			42	119	104	14			218
3			18	128	158	68			172
4				123	178	110			116
5				97	167	130	5		62
6				47	104	98	18		14

6 AM	60	28					4	78	6
7	120	68					4	130	48
8	143	98						178	98
9	133	107	15					182	137
10	98	102	24					182	178
11	39	68	48						202
NOON		37	58	28					205
1 PM			47	68	28				183
2			28	98	88	8			157
3			18	108	128	58			118
4				98	157	68			72
5				78	138	108	4		42
6				28	88	78	14		8

6 AM	104	22					10	98	18
7	107	60						134	88
8	105	108	5					168	138
9	100	130	32					84	178
10	107	150	58					6	208
11	39	159	69	9					228
NOON		108	98	57					250
1 PM		9	97	108	38				228
2			64	128	104	6			210
3			38	148	158	98			168
4			5	138	178	108			117
5				102	167	134			58
6				48	104	98	18		18

6 AM	60	28					8	78	6
7	120	68						130	48
8	143	98	4					61	98
9	133	118	28					48	138
10	98	138	58					8	178
11	39	107	69	7					194
NOON		58	78	44					218
1 PM		7	67	81	38				188
2			49	104	88	8			188
3			24	118	138	48			138
4			4	104	157	77			88
5				78	138	98			42
6				37	88	78	18		8

HEAT ABSORBING GLASS

B.T.U. TRANSMITTED INTO ROOM PER SQ. FT. OF GLASS PER HOUR

6 AM	104	38					28	98	19
7	107	64					9	134	88
8	105	117						205	155
9	100	154	6					91	191
10	107	84	20						230
11	39	65	30						235
NOON		38	44	23					257
1 PM			36	46	38				234
2			28	100	104	38			201
3			7	108	156	78			176
4				98	178	130			118
5				92	167	134			58
6				48	104	98			10

6 AM	60	28					18	78	6
7	120	68					9	130	48
8	143	98						178	98
9	133	98	6					182	138
10	98	99	15						177
11	39	64	28						195
NOON		39	34	18					205
1 PM			28	38	28				188
2			17	78	88	28			178
3			6	98	128	68			134
4				98	157	98			92
5				78	138	108			48
6				38	88	78			9

6 AM	60	28					14	78	6
7	120	68					4	130	48
8	143	98						178	98
9	133	107	15					182	137
10	98	102	24					182	178
11	39	68	48						202
NOON		37	58	28					205
1 PM			47	68	28				183
2			28	98	88	8			157
3			18	108	128	58			118
4				98	157	68			72
5				78	138	108	4		42
6				28	88	78	14		8

6 AM	60	28					8	78	6
7	120	68						130	48
8	143	98	4					61	98
9	133	118	28					48	138
10	98	138	58					8	178
11	39	107	69	7					194
NOON		58	78	44					218
1 PM		7	67	81	38				188
2			49	104	88	8			188
3			24	118	138	48			138
4			4	104	157	77			88
5				78	138	98			42
6				37	88	78	18		8

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H. & V.'s REFERENCE DATA—173

SUN HEAT TRANSMISSION OF SINGLE WINDOWS

The table on the opposite side of this sheet is devoted to the quantities of solar heat which will be transmitted into a room through single glass windows. It is designed particularly for summer application in connection with air conditioning.

Inasmuch as the amount of sun incident to a given wall depends on the latitude, the altitude of the sun, and the direction faced by the wall, all of these are taken into account in the table. The figures given are in B.t.u. per square foot of glass per hour and represent the amount of solar heat entering the room entirely independent of the amount of heat entering the room due to the temperature differential between the inside and outside air. The figures apply to ordinary thicknesses of ordinary and heat-resisting glass; in the case of the latter the figures are conservative. That is, commercial heat-resisting glass is available for which claims are made for somewhat smaller transmission values than given here.

To use the table on the opposite side of this sheet, determine the zone of the city where the installation is located by referring to the map, follow the arrow to the proper table, and opposite the time of day and under the direction faced by the window find the solar heat entering the room per square foot during the hour in question.

Example: What will be the summer heat gain at 3 p.m. through two windows 7 ft. x 5 ft., ordinary single glass, in the SW wall of a Washington, D. C., building, and how much heat would be saved by using heat-absorbing glass?

SOLUTION: Refer to the table. The map shows that Washington lies in Zone 3. Follow the arrow to the tables indicated. Opposite 3 p.m. and under SW find 131 for ordinary glass (left hand table) and 101 for heat-absorbing glass (right hand table). These figures are per square foot, so that the transmission of the plain glass window during the hour from 2:30 to 3:30 p.m. is estimated at $(7 \times 5) \times 131$, or 4585 B.t.u.

The heat-absorbing glass transmission would be $(7 \times 5) \times 101 = 3535$ B.t.u. for the same hour. The saving would be 4585 — 3535 or 1050 B.t.u., for the hour.

In the case of skylights in this building, the loss would be 172 and 133 B.t.u. per square foot for the hour in question in Washington for plain and heat-absorbing glass, respectively.

The preceding information deals with unshaded windows. If there are shade trees outside the window the heat gain from the sun is sharply cut down, sometimes to the point where it becomes of little moment. In most cases, though, especially in cities, artificial shading must be relied on to reduce the solar energy impinging on the window. In a very valuable series of tests by the research laboratory of the ASHVE, the efficacy of various types of shading on windows was determined. This information is summarized in the accompanying table, with the results relative to an unshaded window. This table shows, for example, that an ordinary canvas awning allows only 28% as much solar energy to pass through a window as falls on an unshaded window.

Although these tests applied to heat passing through ordinary windows, the figures given can be applied, for all practical purposes, against the figures in the table on the opposite side of this sheet. That is, the figures in that table can be multiplied by the factors in the shade table to determine the heat transmission of plain or special glass with various methods of shading.

Example: What would be the heat gain in mid-summer, through a 3 x 6 ft. single glass window at 4 p.m. in a Memphis building provided the window has venetian blinds and faces the west?

SOLUTION: Referring to the main table, Memphis lies in Zone 2, and in the Zone 2 tables find, opposite 4 p.m. and under W, 178 for plain glass and 137 for heat-absorbing glass. In the shade table, the factor for venetian blinds is 58%. Therefore, the heat transmission for that hour for an ordinary glass so shaded would be

$$(3 \times 6) \times 178 \times .58 = 1858 \text{ B.t.u.}$$

and for heat-absorbing glass

$$(3 \times 6) \times 137 \times .58 = 1430 \text{ B.t.u.}$$

The data given on this sheet apply only to single windows. Use of double windows will reduce the amount of solar heat transmitted.

EFFECT OF SHADING WINDOWS

RELATIVE QUANTITIES OF SOLAR HEAT IMPINGING ON UNSHADED AND VARIOUS TYPES OF SHADED WINDOWS.

Unshaded windows	100%
Inside shade (buff), half drawn	68
Inside venetian blind, drawn, slats at 45°	58
Inside shade (aluminum), fully drawn	45
Canvas awning (plain)	28
Canvas awning (aluminum)	22
Outside venetian blind (aluminum), slats at 45°	22

Figures are from tests conducted by Houghten at the ASHVE Research Laboratory.

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NEWS OF THE MONTH

N.Y. Factories Installed Nearly 2,000 Ventilating Systems in '39, Hatch of State Labor Dept. Tells Buffalo Group

BUFFALO—Ventilation is waging a successful battle against silicosis and other diseases attributed to unhealthy atmospheric conditions in industry all over the country, according to Theodore Hatch, associate dust control engineer of the New York State Division of Industrial Hygiene, Department of Labor, speaking before the Western New York chapter of the ASHVE here April 8.

Executives and engineers from at least 30 different industrial plants joined the estimated 350 heating and air conditioning men at the dinner.

In a highlight of his talk, Mr. Hatch stated that by reducing concentrations of dust and other injurious atmospheric conditions such as fumes and gases a hundred-fold in the past several years, air cleansing and ventilating systems in industry have been directly responsible for a proportional decrease in cases of silicosis and other menaces to health.

Illustrating the more important phases of his discourse with slides, the New York dust control engineer said:

"Our ventilating systems are the answer to the vital problem of health maintenance in industry all over the country today. Fortunately, the problem can be analyzed and subsequently controlled. In recent years tremendous strides in this direction have been taken."

"Engineering methods have been devised to overcome all sorts of conditions," he stated, "and yet there are many failures in that respect. Usually these failures are attributed to 'limits' set up by plant managements, or the lack of knowledge of the importance of the proper study of an existing detrimental condition prior to the installation of a ventilating system.

"In too many cases a system goes in without any preliminary engineering study, and often because the management does not know better. The result often is a failure and a total loss in dollars and cents.

"For example, a stone-crushing plant I have in mind, interested in air cleansing, was offered a 14,000 c.f.m. system from one contractor and a 30,000 c.f.m. system from another. The management without any study took the 14,000. Shortly after it was installed, it proved a failure. The reason? The management was not enough interested in air conditioning to find out why the other contractor had suggested a 30,000 c.f.m. system. Eventually the cost of installing an adequate system proved much greater than it would have were the proper steps taken."

Pointing to industry's struggle against silicosis and similar health

Theodore Hatch, associate dust control engineer of the New York State Division of Industrial Hygiene, Department of Labor.

hazards, Mr. Hatch stated the fight is being waged successfully, and that up to 2000 ventilating systems were installed in New York State alone in 1939.

"Various forms of ventilation," he said, "are being used only to do away with nuisances, but there are others used actually to make it possible for industries to continue.

"Air conditioning is rapidly coming to the stage where it is being recognized as a very important factor in the production of a plant and even more important in the maintenance of health. It must be regarded as part of the cost of production.

"Fortunately, foundries all over the country are rapidly realizing that dust, fumes and gases can be controlled, and that while they are controlled, production costs are cut down and better materials are turned out besides."

Mr. Hatch pointed out how study of unfavorable air conditions in industry often reveals reasons for the existing conditions and eventually leads to their elimination, tending to make air cleaning systems many times more effective.

"For instance, one ore crushing plant I am familiar with, after a bit of study, decided a wet process in crushing ore would check a good percentage of the dispersement of dust particles," he said.

"In another case, a plant is substituting new burners which will not produce carbon monoxide for an older type burner. Then, in the hat making industry mercury poisoning was common among men in its employ because mercury nitrate was used in processing felt. Study being carried on right now regarding this is revealing that it may be possible to substitute a nontoxic for mercury nitrate in the process.

"Studies such as the ones I have pointed out must be conducted in order to assure the success of an air conditioning system and possibly prevent its failure. Perhaps many will not agree with me, but the ventilating system itself is of secondary importance. The study of the reasons for the existing health menaces must come first."

School Ventilation Law Changed

ALBANY, N. Y.—Mandatory ventilating requirements in New York State public schools were eliminated under terms of a bill signed into law here April 13 by Governor Herbert H. Lehman. Adversely affecting the ventilating and air conditioning industry, the measure was successfully sponsored during the recent 1940 session of the State Legislature by Assemblywoman Edith C. Cheney, Steuben County Republican, as an economy move designed to save an estimated $150,000 annually.

The new measure, effective immediately, amends the state education law, in relation to adequate facilities for heating and ventilation in school buildings, providing: "The commissioner of education shall not approve the plans for the erection of any school building or addition thereto or remodeling thereof unless the same shall provide facilities for heating and ventilation adequate to maintain healthful and comfortable conditions in classrooms and study halls."

Eliminated from the law was a former mandatory requirement that plans for new school buildings, additions or remodeling must provide at least 15 square feet of floor space and 200 cubic feet of air space for each pupil to be accommodated in each study or recitation room therein; for assuring at least 30 cubic feet of pure air every minute per pupil, and that facilities for exhausting the foul or vitiated air therein shall be positive and independent of atmospheric changes.

The former mandatory equipment requirements had been termed extravagant in a report of the State Board of Regents, which estimated that by leaving the question of ventilation up to the architects and the commissioner of education, as provided in the Cheney bill, a saving of about $150,000 a year would result to local school jurisdictions.

The Cheney bill was one of a few signed in recent years by Governor Lehman despite the expressed opposition of the State Federation of Labor. The Cheney bill presumably had the support of the educational groups of the state who have long been opposed to mechanical ventilation of schools.

Air Conditioning for Health Important as Comfort or Process, Specialist on Air-Borne Infection Tells Engineers

CAMBRIDGE, MASS.—Members of Massachusetts chapter, ASHVE, held their monthly meeting April 16 at Massachusetts Institute of Technology, with Dr. Grantley W. Taylor, surgeon, Collis P. Huntington Memorial Hospital, and Dr. William F. Wells, director of the Laboratories for the Study of Air-Borne Infection at the University of Pennsylvania School of Medicine, as the guest speakers. Their subjects, respectively, were: "What We Should Know About Cancer," and "Disinfection of Air." Dr. Taylor said in part:

"We know little about the controlling factors which are responsible for the harmony of normal growth—we may assume they are nutritional, or due to chemical or other influences. . . . Cancer, on the other hand, is an abnormal growth in that it does not obey the rules. The growth is not taking place in response to a demand or need of the body. It fulfills no useful function and its growth is in disharmony with the surrounding tissues. Not only is there disharmony with the surrounding tissues, but even within the cancer itself there is unbalanced growth of blood vessels, connective tissue, and so on.

"Treatment to be effective must attack and totally destroy the disease in its early stages, before it has set up widely disseminated metastases. When proper treatment is applied in early stages, cure can be achieved in a very high percentage of cases." In his talk Dr. Taylor gave recognition to the part played by atmospheric pollution, particularly the tarry matter in the air, as predisposing factors to cancer. Thus his talk had a direct interest for air conditioning and ventilating engineers.

Dr. Wells showed, by means of slides, various methods of utilizing ultra-violet radiation in bactericidal work, together with slide presentation of the spread of epidemic children's diseases studied under ordinary interior atmospheric conditions and when ultra-violet radiation was used. He stated that the velocity of air movement makes no difference in the bactericidal effect of the rays, provided there is total exposure of the bacteria to the rays.

"Air-borne contagion is a challenge to engineers of heating ventilating and air conditioning systems for spaces involving human occupancy," he said. "Sanitary engineers long ago ceased to think in terms of mere adequate water supply, and successfully met the typhoid issue. Commercial handling of dairy and food products has been engineered to a standard which has removed most causes for concern as to their being carriers of infection.

"Pasteurization of milk has resulted in prevention of four out of five deaths of infants occurring before the age of two years prior to the use of this process, which has resulted in several million persons being alive today who owe their lives to engineering application of medical knowledge.

"Marketers of air can meet the challenge by adding more health engineering to the fine job being done for comfort and convenience. Theirs is the job to stop the spread of infection by means of air in enclosed spaces where people live or congregate. The air we breathe is the most important vehicle of contagion in concentrated spaces or crowds in rooms."

Answering a question from the audience, Dr. Wells said that any effect of positive and negative discharges did not approach the ultra-violet ray for lethal action. Ozone and sunlight both have that effect, but they do not work fast enough to kill off bacteria before infection is spread in enclosed atmospheres. To do this we must have speedy action.

"Study of the bacterial behavior of air has revealed a mechanism of air-borne infection. Evaporation of minute droplets, expelled in respiratory processes, enables infection to ride these droplet nuclei on air currents.

"Studies indicate that the transfer of nuclei infection from infector to infectee varies with the conditions of sanitary ventilation. The equilibrium concentration predicted by the ratio of the venting rate to the addition rate of test organisms in semi-enclosed spaces corresponds to the concentration of naso-pharyngeal organisms determined by sanitary air analysis.

"Recognition of vehicles of spread of infection leads to methods of disease prevention. Studies on prevention of contagion by the bactericidal irradiation of the air we breathe promises conclusive evidence of the importance of air as a vehicle of contagion."

Dr. Wells is a pioneer in health engineering related to air circulation and for several years has given much attention to a problem that air conditioning engineers must face, as the air conditioning industry grows and air conditioning is extended to places where there are large concentrations of people in varied conditions of health.

He was associated for six years with the Harvard School of Public Health and the Harvard Graduate School of Engineering. Progress made at Harvard caused a grant to be made for the present laboratories for the study of air-borne infection at the University of Pennsylvania School of Medicine. For the past three years he has acted as the liaison medium between the engineering profession and the medical school at the University.

Degree-Day Check Gives Economy, Hieronymus Tells Illinois Group

CHICAGO—The March meeting of Illinois chapter of the ASHVE was attended by 77 members and guests. C. M. Burnam, Jr., introduced the speaker of the evening, R. E. Hieronymus, general superintendent of Aldis & Company, who discussed "Mechanical Equipment in Buildings."

Mr. Hieronymus opened his remarks with a discussion of heat economy in buildings as correlated with the degree day. Experience gained by Mr. Hieronymus and his building managers in the use of the degree day chart and the Erlenborn chart has proved that the use of these charts are quite effective in providing heat economy. The speaker pointed out that efficiency of operation was dependent upon two factors, economy through basement process (that is, fuel burning equipment, type of fuel, etc.), and "upstairs" utilization of steam, and it was to the second of these factors that the speaker devoted most of his remarks. He took as a specific example a building with a content of approximately 2,300,000 cu. ft. and with an enlarged copy of the Erlenborn chart traced through the procedure for a month's operation, with particular reference to how the degree day formula could be applied.

According to Mr. Hieronymus, a recent survey of 30 Chicago Office Buildings indicated that the average steam consumption for 1,000 cu. ft. of volume was .5838 pounds of steam per degree day in one-pipe differential systems and .5800 pounds of steam in two-pipe systems, provided daily checks of the degree day chart were made. The most significant fact, however, was that buildings making no check averaged .761 pounds, buildings making a monthly check .717 pounds, and buildings making a daily check .592 pounds.

Following the discussion on heat economy, Mr. Hieronymus went into the subject of "Air Conditioning" using as a basis the Monroe-Dearborn two-story tax-payer. He gave a comprehensive description of the plant which provides complete year round air conditioning to a rentable area of 39,200 sq. ft. The plant represents a capital investment of $94,000, which was $50,000 in excess of a straight heating installation. However, the management feels after several years of operation that this was a good investment for the building, since operating costs have not been excessive and renting has been aided.

Mr. Hieronymus then called on Mr. C. N. Bailey, who is associated with him in the operating department of Aldis & Company. Mr. Bailey discussed a color code used in the operating chart of the Monroe-Dearborn Building.

Gas Utilities Asked to Promote Gas Summer Air Conditioning; Castle and Bellamy Speak at Toledo Conference

TOLEDO—Density of population is a more important factor in creating a market for summer air conditioning than is high average temperature, according to Kenneth B. Castle, Jr., of Rochester Gas and Electric Corp., in addressing the American Gas Association Conference on Industrial Gas Sales at the Commodore Perry Hotel here March 28-29.

About 215 industrial gas engineers from all parts of the country attended the conference which covered a number of phases of industrial gas applications, including volume water heating and process and comfort air conditioning.

Charles R. Bellamy, Columbia Gas & Electric Corporation, New York, chairman of the AGA Joint Committee on Summer Air Conditioning, was among those who addressed the conference.

In his talk Mr. Castle pointed out that the actual outdoor temperature seldom represents more than 25% of the cooling load on an air conditioning installation, but where large centers of population exist, loads within buildings resulting from human heat, light, power, and other sources "pile up." Another controlling sales factor is that "it's a condition of air within an enclosed space that is being merchandised, and not a piece of equipment."

With respect to the competitive problem, it was Mr. Castle's belief that electric competition is mainly interested in the increased fan, lighting, and light motor loads involved in air conditioning, and that, therefore, efforts by the gas industry to develop air conditioning business will not be too strenuously opposed, except perhaps where gas engine or turbine units invade the power field. In fact, it was pointed out that both interests can cooperate to their mutual benefit.

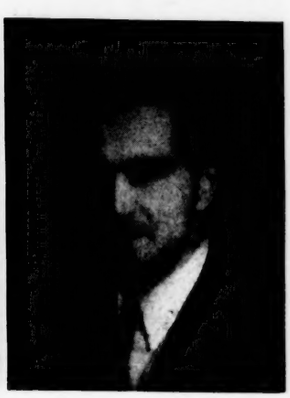
With regard to the place of the utility in developing interest in air conditioning, the speaker claimed that of 200 Rochester jobs installed since 1932 "utility employees were active in the sale of 147 (73%) of them, totaling 94% of the horsepower." He urged the gas industry to take definite steps in securing the air conditioning load with the expectation that less time, man power, and sales ingenuity will be required as the market is broken down, but "to carry out this work, gas companies must have engineers trained in air conditioning."

Speaking for the Joint Committee on Summer Air Conditioning Mr. Bellamy suggested that fifteen or twenty of the larger utilities each hire a competent, experienced air conditioning engineer to: study the field in every aspect; enlist the cooperation of dealers, architects and contractors, and produce recommendations, prospect lists, and promotional stimulation. A series of 15-minute discussions, led by the manufacturers of gas-fired air conditioning equipment followed. Those speaking for the manufacturers included: C. F. Cushing, The Bryant Heater Co.; F. M. Johnson, Surface Combustion Corp.; G. L. Simpson, Pittsburgh Lectrodryer Corp.; G. F. Zellhoefer, Williams Oil-O-Matic Heating Corp.; John K. Knighton, Servel, Inc., and Glen Miller, Southern Counties Gas Co., Los Angeles, speaking for the Mills system. Finally, the meeting considered, in turn, the domestic, commercial and industrial markets for gas air conditioning. It was agreed that the commercial and the industrial, only, offered lucrative immediate prospects, and the place of the split system in obtaining this business was emphasized.

Lawrence E. Biemiller, chairman of the Volume Water Heating Committee, held out for 180F water for dishwashing and sterilization. The committee encouraged the use of new improved water mixing valves as a practical means of obtaining better large volume water temperature constancy under highly varying rates of flow.

To many the high point of the conference was the Clinic on "Near-Infra-Red Ray Heating." Near-infra-red ray heating was defined as "radiant heating from incandescent bodies at temperatures of from 3500 to 5000F."

Researches currently being sponsored by the American Gas Association Committee on Industrial Gas Research were described. These were reported as quantitively demonstrating the difficulties of infra-red heating with respect to: (1) the shape and thickness of the work, (2) variations in color and type of finish, (3) differences in the finish of the metal upon which coatings are cured, (4) slight differences in the distance of various parts of the work from the lamps, (5) necessity for keeping reflectors permanently clean, and (6) "shadows" cast by conveyors or the work itself upon areas to be cured. Considerable detail was given demonstrating the higher efficiencies and shorter curing times necessary for identical bakes with convection as over and against radiant heating, and it was shown that the radiant heating man's claim of curing the surface without bringing up the temperature of the body of the piece could be made equally well for recirculated air heating operating at high temperatures and high percentages of recirculation.



(Left) One of the sessions at the AGA conference on Industrial Gas Sales held at Toledo, March 28-29. (Right) K. B. Castle, Jr., of the Rochester Gas and Electric Corporation, who spoke on "Factors Involved in Merchandising Gas Air Conditioning."

Standard Setting Heights Adopted

CHICAGO—At a meeting of its executive representatives March 12, the Stoker Manufacturers Association approved the recommendations of its engineering committee as to minimum setting heights for stoker installations. This approval is the climax of several years of work by the engineering committee which has been studying stoker and boiler setting heights and combustion space for underfeed stoker-fired boilers burning bituminous coal in capacities ranging from the smallest household unit up to machines burning 1,200 lb. of coal per hour. The recommended minimum setting heights are in the form of two curves incorporated in the S.M.A. Standard Code.

The recommended heights can be expressed in the form of two equations: the first is

$$H = .1125\ B + 15.75$$

where H = the minimum setting height in inches and B = the burning rate in pounds of coal per hour. This equation applies only to burning rates below 100 lb. of coal per hour. The second equation applies to burning rates of from 100 to 1,200 lb. per hr., and is:

$$H = .03\ B + 24$$

Air Temperature and Humidity Affect Human Bodies Sharply, Dr. Young Tells Buffalo Air Conditioning Council

BUFFALO—Hospital superintendents from all parts of Western New York attended the April 23 meeting of the Air Conditioning Council of Western New York when Dr. Albert G. Young, Medical Director of the Corey Hill Hospital, Brookline, Mass., was guest speaker.

Dr. Young prefaced his remarks by declaring that air conditioning "can be either an asset or a liability—depending on its installation and use. If a hospital plans to install air conditioning it should first decide how much it is going to spend and then get a good consulting engineer."

The effect of temperature and humidity on the human body is of greater significance than has been previously supposed, Dr. Young declared. "The body, like an internal combustion engine, functions best at an optimum temperature. If this temperature varies too greatly in either direction, marked physiological changes result; thus if the individual is exposed to severe cold, even over a small area, the blood pressure rises."

This is shown, the speaker said, by immersing the hand in ice water—the blood pressure will increase in the normal individual as much as 30 to 40 millimeters mercury in the systolic pressure with a corresponding rise in the diastolic pressure.

"In the normal individual, this increased pressure is maintained for only 30 to 60 minutes. However, in a patient with high blood pressure this increase may persist for a matter of hours. This is one reason why patients suffering from high blood pressure should not be exposed to severe cold."

Dr. Young said any increase in body temperature or any attempt on the part of the body to dissipate its heat formation is marked by an increase in the circulation. This is due to the fact that the skin is the chief source of heat dissipation from the body.

"Normally the body established an equilibrium between heat formation and heat loss so that a body temperature of between 98F and 99F is maintained. If the atmospheric temperature is increased, the normal body temperature can be maintained by diverting some of the blood through capillary circulation in the skin, which means that there will be less circulation to the internal organs."

In a dry atmosphere, the speaker said, a normal temperature can be maintained if the individual is able to perspire when the surrounding temperature is as much as 120F to 130F. However, good ventilation must be provided.

"As the humidity is increased, the possibility of maintaining a normal temperature under increased atmospheric temperatures is reduced proportionately to the increase in humidity. This is generally recognized by the discomfort suffered by the individual in hot humid weather. The physiological changes that take place account for the discomfort."

"A normal man lightly clothed entered a room under the following conditions. Temperature 80F, relative humidity 48%, the room was ventilated by an electric fan. On entering the room, examination showed blood pressure 116/74 mm.; pulse 72; respiration 13; body temperature 98.4F. Temperature of the room was gradually increased to 98F; the relative humidity and ventilation remained constant. At the end of 75 minutes the blood pressure had fallen 18 mm. mercury systolic and 8 mm. mercury diastolic, giving the blood pressure 98/66; pulse continued 72; respiration 14; body temperature 98.7. Increase in the room temperature to 102F, and the relative humidity to 58%, caused the pulse rate to increase to 82; respiration to 15; and the body temperature increased to 99.1F.

The man was not uncomfortable at rest, Dr. Young said, perspired freely and felt relaxed. The same man studied the next day when the room temperature was 100F, with a saturated relative humidity and ventilation the same, showed the following results at the end of 60 minutes; blood pressure dropped from 116/68 to 108/66; pulse had increased from 74 to 108, and respiration from 14 to 19 per minute. Body temperature had increased from 98.6 to 100.4F. The man was uncomfortable, irritable and found it difficult to perform simple mental calculations.

"When the hypertensive patient is placed in a steam bath, which allows his head to protrude so that he can breathe normal, dry air, he can withstand much more temperature and humidity over the rest of his body. This shows that the condition of the air that is being breathed is important to the welfare of individuals."

Dr. Young said: "We have recently made a study of the effect of meteorological conditions on the occurrence of pulmonary embolism following operations and injuries. This study was made over a five-year period at the Boston City Hospital. It was very definitely shown that the greatest number of emboli occurred when the relative humidity was high, regardless of whether the conditions were due to injury, operation or childbirth. In the years that were usually dry, there was a definite decrease in the number of emboli."

Contractors Welcome IBR Ratings

NEW YORK—The standardization of cast iron boiler ratings as adopted by The Institute of Boiler and Radiator Manufacturers recently was praised in a statement issued April 17 by George P. Nachman, chairman of the standards committee of the Heating, Piping & Air Conditioning Contractors National Association. Mr. Nachman said:

"The Heating, Piping & Air Conditioning Contractors' National Association welcomes the standardization of boiler ratings. For many years, this association of contractors sought to obtain such standardization on the part of the manufacturers, and its committee on boiler output, headed by H. M. Hart as chairman, succeeded in establishing definite methods and developed tables of ratings. It is indeed gratifying that the Institute of Boiler and Radiator Manufacturers have agreed to IBR testing and rating codes, and that IBR emblems will be used.

"IBR ratings are to be expressed as follows:

(a) Gross IBR output in B.t.u. per hour; (b) Net IBR rating, which is the gross output less allowances for piping and pickup. The net IBR rating should be interpreted as the installed radiator load where average or normal installation conditions exist. Net IBR rating is expressed in B.t.u. per hour as well as in square feet of steam and water.

"Although IBR ratings so far apply only to boilers with grate widths up to 20 inches, it is hoped that these will be extended to larger sizes in the very near future.

"This standardization is certainly the most important and constructive step ever taken by the manufacturers of cast iron heating boilers.

"The Heating, Piping & Air Conditioning Contractors' National Association, through its standards committee, welcomes the birth of the IBR rating program, and hopes that it will be extended to the larger sizes at the earliest opportunity."

Well Water Cools Buffalo Theater

BUFFALO—An old underground stream has been tapped by engineers to provide an air-cooling system for the Capitol Theater here.

Water has been noticeable for years beneath the theater boiler-room, so Manager George F. Hanny, Jr., had well-drillers, probe 90 feet beneath the sidewalk in front of the building. They finally struck water.

The temperature of the water is 59F degrees and the pressure 200 gallons a minute—ideal conditions to cool the theater. Another well will be drilled beneath the theater to receive the water after use.

161 A.C. Jobs for N.Y. in 1st Quarter

NEW YORK—According to reports by the Consolidated Edison Co. of N. Y., Inc., 121 air conditioning installations, totalling 6653 hp., were added to the company's lines in Manhattan during the first three months of 1940. The company also reports, for the same period, 21 installations added in Brooklyn, totalling 339 hp.; 7 installations in the Bronx, totalling 389 hp., and 12 installations in Queens, totalling 204½ hp.

Chicago Has 2051 A.C. Installations

CHICAGO—Up to December 31, 1939, air conditioning installations in the City of Chicago, totaled 2051, according to a compilation recently released by the Air Conditioning Division of the Commonwealth Edison Co. These systems had a total capacity of 80,046 hp. In addition, there were 1720-room cooling units installed up to that time, totalling 1363 hp.

The figures include all of the installations and units added to the company's lines over a period of years to the end of 1939. The table presents this information broken down by type of installation and by period in which the installation was made.

St. Louis Has New Smoke Ordinance

ST. LOUIS—A new smoke prevention ordinance for St. Louis makes mandatory the use of smokeless fuels or mechanical firing equipment that will burn fuel without smoke. The ordinance contains a provision, hitherto not found in municipal smoke legislation, which empowers the city, after declaring an emergency, to purchase smokeless fuel in wholesale lots and distribute it to consumers if an adequate supply cannot be secured through commercial coal dealers.

The new smoke ordinance in St. Louis requires smokeless fuel in hand-fired and surface-burning furnaces. Such fuel is defined as containing less than 23% volatile matter. Sale of any fuel containing more than 12% ash or 2% sulphur on a dry basis is prohibited in the city.

A special committee on smoke elimination worked for a year before presenting the report that resulted in the St. Louis smoke ordinance. In requiring smokeless fuel, the committee expressed the hope that restrictions on the use of unprocessed high volatile coals would create a large market for smokeless fuels, and thus make possible a reduction in their price.

NFPA May Revise Its A.C. Standards

BOSTON — Amendments to the National Fire Protection Association's Standards on Air Conditioning will be offered by the Air Conditioning Committee at the 44th Annual Meeting of the Association which will be held in Atlantic City on May 7-11. Carl W. Wheelock is chairman of the committee. In addition, a progress report of the Committee on Blower Systems will be presented by Winthrop M. Jones, chairman of the committee. Both of these reports will be presented at the afternoon session on Friday, May 10.

At the morning session on May 10 the report of the Committee on Flammable Liquids will be presented. Part of this report deals with oil burning equipments. Slight changes are proposed in the regulations for oil burners.

Fan Manufacturers Elect Szekely

CHICAGO—The National Association of Fan Manufacturers, at its annual meeting here April 11, elected E. Szekely president, H. Mathis, vice president, and L. O. Monroe as secretary-treasurer for the ensuing year.

The next regular meeting of the Association will be held at White Sulphur Springs, Va., June 14.

SUMMARY OF AIR CONDITIONING INSTALLATIONS IN CHICAGO PROPER
COMPILED BY AIR CONDITIONING DIVISION, COMMONWEALTH EDISON COMPANY

	Prior 1933		1933		1934		1935		1936		1937		1938		1939		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Systems																		
Amusements	0	0	0	0	0	0	0	0	0	0	1	33	3	107	5	196	9	336
Banks	5	905	1	200	3	45	0	0	2	428	1	5	3	164	2	23	17	1,773
Barber Shops	0	0	0	0	0	0	0	0	3	9	1	0	0	0	2	4	6	14
Beauty Shops	1	4	0	0	3	58	7	45	3	47	4	15	8	33	3	14	29	218
Brokers and Exchanges	4	694	2	26	3	52	0	0	6	110	0	0	0	0	0	0	15	883
Churches	1	90	1	5	1	65	1	7	0	0	0	0	3	127	0	0	7	294
Civic Building	1	450	1	116	0	0	0	0	1	150	0	0	1	30	0	0	4	746
Clubs	3	357	1	2	0	0	0	0	2	87	3	35	0	0	0	0	9	481
Dance Halls	4	465	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	465
Doctors and Dentists	0	0	0	0	0	0	0	0	0	0	0	0	4	19	1	1	5	20
Funeral Parlor	1	1	2	10	5	42	10	107	13	171	15	245	20	173	11	140	77	891
Hospitals	1	30	0	0	1	3	4	47	0	0	0	0	2	7	1	5	9	94
Hotels	13	3,187	2	72	8	124	2	148	2	32	4	1,087	3	44	3	37	37	4,733
Industrial—Bakeries	18	303	0	0	0	0	1	1	1	50	1	4	1	15	2	28	24	403
—Candy	19	2,451	3	733	4	381	5	233	11	441	5	177	2	23	8	264	57	4,705
—Printing	13	1,800	1	201	5	98	4	143	2	20	6	462	2	46	1	97	34	2,871
—Misc'l.	6	609	3	179	9	353	9	119	8	230	7	635	4	111	10	78	56	2,317
General Office and Bldg.	18	4,493	9	265	25	1,561	29	693	56	1,756	62	4,249	55	859	61	740	315	14,617
Private Offices	18	53	13	28	25	90	13	28	18	39	9	23	6	20	10	19	112	303
Residence	5	33	5	7	5	28	6	14	7	15	14	56	9	38	4	11	55	204
Restaurant	37	1,394	20	471	30	563	49	1,129	64	1,510	105	1,931	88	1,379	93	1,128	486	9,508
Stores—Candy	0	0	4	13	3	5	8	13	15	73	7	28	13	68	7	34	57	236
—Clothing	3	317	1	3	6	1,074	16	449	15	1,168	16	425	23	443	21	415	101	4,296
—Drug	1	28	0	0	5	104	14	141	13	187	20	184	23	228	39	374	115	1,248
—Food	7	385	0	0	0	0	0	0	3	46	6	44	8	32	15	58	39	567
—Fur	2	2	0	0	2	7	3	13	6	48	6	31	3	16	6	28	28	147
—Shoes	2	34	1	10	4	29	8	55	10	130	26	341	9	65	5	20	65	687
—Misc'l.	2	215	3	443	3	167	8	227	14	867	21	406	6	115	11	290	68	2,731
Studios	1	346	1	9	1	12	2	52	0	0	3	10	4	51	2	20	14	501
Theaters	53	14,608	11	585	32	2,589	29	1,633	17	1,049	34	1,880	11	671	10	733	197	23,749
Total	239	33,260	85	3,381	183	7,455	228	5,302	292	8,674	377	12,314	314	4,891	333	4,765	2,051	80,046
Room Coolers																		
Doctors and Dentists	0	0	2	1	2	2	11	7	9	6	25	20	42	25	151	84	242	145
Private Offices	0	0	19	28	25	41	53	60	73	65	121	126	194	148	366	274	851	742
Residences	0	0	8	10	17	11	21	20	43	30	44	50	101	73	267	147	501	341
Miscellaneous	0	0	0	0	6	5	6	6	9	9	9	46	26	23	70	46	126	135
Total	0	0	29	39	50	59	91	93	134	110	199	242	363	269	854	551	1,720	1,363

Compton Tells of MIT Experiments

SEATTLE — Alumni of the Massachusetts Institute of Technology, addressed by Dr. Karl Taylor Compton, president of MIT, were told of the extensive research now being carried on by the institute to heat homes by storing energy of the sun in summer. Dr. Compton outlined the plan, now the subject of experimental work which would make obsolete considerable heating equipment.

Dr. Compton pointed out that: "We're experimenting with heat traps, copper plates that collect the sun's heat and store it in the form of hot water. . . . The water is stored in a heavily insulated water tank underground. We want to see how long it will keep."

Such energy, he added, could be used to air condition houses in the summer as well as heat them in winter, and he stated, furthermore, that his colleagues are certain that there are possibilities of utilizing the energy of the sun advantageously in places where there is considerable sunshine.

Hotels Find A.C. Profitable

WASHINGTON—In response to a questionnaire to hotels which are air conditioned, 29 hotels replied that air conditioned rooms have been a good investment as compared to 2 reporting that the investment was not justified. According to William B. Henderson, executive vice-president of the Air Conditioning Manufacturers' Association, reporting on a survey made by Hotel Management, 62 hotels favored air conditioning in both winter and summer as compared to 8 who replied in the negative. 65 hotels replied that increased patronage resulted in their air conditioned restaurants while 5 answered "No" to this question. Of the hotels questionnaired, 41 have central type air conditioning equipment and 37 unit type installations.

One of the questions asked was, "How large does a hotel restaurant have to be to justify installation of air conditioning equipment?" to which 87 replied that all restaurants should have it regardless of size.

Club Ventilated by Sand Cooled Air

NARRAGANSETT, R. I. — An unusual method of ventilation is to be used here this coming summer in the recently completed Dunes Club building, which replaces one destroyed in the September, 1938 hurricane. Used only in summer, the main clubhouse is cool enough, with breezes from the Sound, but the kitchen is ventilated by drawing cool air from the sand beneath the building, passing it through the kitchen and discharging it through louvered openings in the roof.

Lehigh Awaits Coal Conference; Two Full Days Planned

BETHLEHEM, PA.—Members of the coal trade as well as those engaged in the heating industry have been invited to the Third Annual Anthracite Conference, to be held at Lehigh University here, May 9-10. The conference will be held in the James Ward Packard Laboratory of Electrical and Mechanical Engineering on the campus.

The program follows:

MAY 9—A.M.
SESSION 1

"Proper Use of Domestic Sizes of Anthracite in Home Heating," by A. A. Norrman, Fuel Engineer, D. L. & W. Coal Company.

"Anthracite for Filtration including Case Histories Throughout the World," by Homer G. Turner, Filtration Consultant, Anthracite Institute.

"Mining and Combustion Engineering, As an Opportunity for the Young Engineer," by A. C. Callen, Dean of the School of Engineering, Lehigh University.

"Mineral Wool Insulation from Anthracite Ash and Anthracite Culm Banks," by H. J. Rose, and R. C. Johnson, Anthracite Fellowship, Mellon Institute of Industrial Research.

MAY 9—P.M.
SESSION 2

"Application of Anthracite to Modern Baking Ovens," by O. E. McGregor, Vice-Pres., Williams Bakery, Scranton, Pa.

"Performance Progress of Domestic Anthracite Stokers and Indicated Need for Further Research," by J. H. Simpson, Gen. Mgr., MotorStoker Div., Hershey Machine & Foundry Co.

"Important New Data and Research on Chimneys and Draft," by Allen J. Johnson, Director, Anthracite Industries Laboratory.

SESSION 3

"The Economics of Preparation of Anthracite as Affected by the Sizing," by Cadwallader Evans, Jr., Vice-Pres., Hudson Coal Company.

"Present Market and Future Opportunities of Utilization of Various Sizes of Anthracite," by J. D. Jillson, Sales Engineer, Anthracite Industries, Inc.

MAY 10—A.M.
SESSION 4

"Radiant Heating," by B. H. Jennings, Associate Professor of Mechanical Engineering, Lehigh University.

"Plans and Progress of Anthracite Research at State College," by A. W. Gauger, Director of Mineral Industries Research, The Pennsylvania State College.

"Interesting Applications of Anthracite Producer Gas." by Eric Sinkinson, Associate Professor of Fuel Technology, Lehigh University.

"Operating Experience with Anthracite in Central Power Stations," by G. H. Frick, Pennsylvania Power & Light Company.

MAY 10—P.M.
SESSION 5

"Modern Methods for Handling Coal and Ash," by Edwin L. Willson, Sales Promotion Manager, Lehigh Navigation Coal Company, Inc.

"Anthracite in Cupolas," by J. F. K. Brown, Assistant General Manager of Engineering, Hudson Coal Company.

SESSION 6

"Practical Results from the Use of Anthracite on Semi-Industrial Stokers," by Joseph H. Kerrick, Combustion Engineer, Philadelphia & Reading Coal & Iron Company.

"Why Have Standards for Burning Equipment," by I. J. Fairchild, Chief of the Division of Trade Standards, U. S. Department of Commerce.

Grant and Shepard to Address ASRE

NEW YORK—Three new local sections formed during the past year in Richmond, Pittsburgh, and Cincinnati, will be inducted into the American Society of Refrigerating Engineers at the twenty-seventh spring meeting of that organization, to be held at Skytop, Pa., June 9-11.

Included on the program for June 11 will be a session devoted to air conditioning, at which George E. Hulse will preside. Papers to be presented at this session include: "Design Problems in Distribution of Air," by Walter Grant, Carrier Corporation, Philadelphia, and "The Problem of the Sales Manager in Air Conditioning", by John deB. Shepard, Consolidated Gas Electric Light and Power Company of Baltimore.

Air Leakage Discussed in Canada

TORONTO — Prof. F. J. Linsenmeyer, head of the department of mechanical engineering, University of Detroit, was the principal speaker at the April meeting of the Ontario chapter of the ASHVE. Prof. Linsenmeyer gave an illustrated discussion on Air Leakage through Full Metal Weatherstripped Windows. Philip H. Foster, of Flin Flon, Man., a member of the Winnipeg chapter, spoke briefly.

The nominating committee of the chapter announced the following officers for election:

For president, Jas. O'Neill, Trane Co. of Canada, Ltd.; vice-president, Fred Ellis, Anthes-Imperial Ltd.; secretary, Harry R. Roth, Canadian Sirocco Co., Ltd.; board of governors. W. Kelly, Iron Fireman Co. of Canada, Ltd.; Douglas Price, General Steel Wares, Ltd.; and C. D. Tasker, Ontario Research Foundation.

Mobile May Amend Its Smoke Laws

MOBILE, ALA.—Recommendations designed to put teeth in the present municipal anti-smoke ordinance were made April 12 in a report submitted to the City Commission by the Engineers Club of Mobile which has just completed a survey of the problem.

The report urged the present law be revised to incorporate a definition of the density of smoke which shall be considered a violation of the law. A city employe would be designated to detect smoke nuisances, using smoke charts for that purpose. He would also be instructed in principles of firing so that he could assist industrial plant operators in combating the problem. A third proposal would require the city building inspector's approval of all plans for new boiler installations so as to insure proper design in future constructions.

District Heating Men to Meet in French Lick May 13; Papers on Weather, Controls, Degree Day Scheduled

FRENCH LICK, IND.—The 31st Annual Meeting of the National District Heating Association will be held at the French Lick Springs Hotel here May 13-17.

In addition to the technical papers, there will be a "Get Together" luncheon at noon, May 14; a tour of the hotel and grounds for the ladies on the afternoon of May 14, and dinner and bridge in the evening of May 14. On May 15 will be a sight-seeing trip for the ladies in the morning, outdoor games for all in the afternoon, a barbecue at 6 in the evening, and an informal dance at 9 in the evening. On May 16 there will be a bridge luncheon and golf tournament for the ladies and men, respectively, with the annual banquet scheduled for that evening.

Included on the technical program are the following:

TUESDAY, MAY 14
a.m.

President's Annual Address, by Glen D. Winans, The Detroit Edison Company.

Report of the Advisory Committee, by J. Earl Seiter, Chairman, Consolidated Gas, Electric Light and Power Company.

Report of the Educational Committee, by Landis Shaw Smith, Chairman, Rochester Gas and Electric Corporation.

Report of the Membership Committee, by Joseph M. Barnes, Chairman, Philadelphia Electric Company.

Report of the Operating Statistics Committee. by William A. Herr, Chairman, Philadelphia Electric Company.

Report of the Secretary-Treasurer, by John F. Collins, Jr.

TUESDAY, MAY 14
p.m.

Chemistry Committee Conference, Past President E. E. Dubry, presiding.

Sales Development & Commercial Relations Committees Conference, Past President J. C. Butler, presiding.

Distribution Committee Conference, Past President W. W. Stevenson, presiding.

Smaller Company Conference, A. S. Griswold, presiding.

Report of the Rates and Regulations Committee, by Russell Hastings, Chairman, Boston Edison Company.

Report of the Meters & Accessories Committee, by A. W. Wieters, Chairman, Toledo Edison Company.

Manufacturers' Forum.

WEDNESDAY, MAY 15
a.m.

Report of the Sales Development Committee, by Robert D. Martin, Chairman, New York Steam Corporation.

Report of Commercial Relations Committee, by N. H. Davidson, Chairman, Rochester Gas and Electric Corporation.

THURSDAY, MAY 16
8:00 a.m.

Sales Development Committee Breakfast Session, Chairman R. D. Martin, presiding.

Commercial Relations Committee Breakfast Session, Chairman N. H. Davidson, presiding.

THURSDAY, MAY 16
a.m.

Report of Steam Station Engineering Committee, A. S. Griswold, Chairman, The Detroit Edison Company, presiding. This report includes the following:

1. Trends in Engineering Research, by A. A. Potter, Dean of Engineering, Purdue University.
2. Oil Fired Boiler, Detroit Ave. Heating Plant, Toledo, by A. W. Wieters.
3. Effect of Customer Temperature Controls on Steam Distribution Systems, by R. C. Hine.
4. Stack Dust Emission and Dust Catching, by A. W. Dierman, R. B. Donworth, R. G. Felger, R. H. McCumber, and G. Prestwick.
5. Oil Burning Experiences in Boston, by G. A. Orrok, Jr.
6. Weather Forecasting, by Dr. Irving P. Krick, Associate Professor of Meteorology, California Institute of Technology.

Report of the Distribution Committee, A. A. Sellke, Chairman, The Detroit Edison Company.

FRIDAY, MAY 17
a.m.

Report of the Chemistry Committee, Louis Shnidman, Chairman, Rochester Gas and Electric Corporation.

Report of the Research Committee, G. K. Saurwein, Chairman, Harvard University, presiding. This report includes the following:

1. Steam Jet Refrigerating Unit Installations During 1939, by Thomas Ravese.
2. City Water Problems in Air Conditioning, by Richard E. Hull.
3. The Enthalmometer Installation, by Thomas Ravese.
4. Maintenance of Thermostatic Traps on Radiators and Riser Traps, by R. Y. Sigworth.
5. Standardization of the Degree-day, by S. S. Sanford and A. W. Wieters.
6. Absorption Refrigeration, by W. F. Friend.

Election of Officers.

N. Y. Limits Water Waste for A.C.

NEW YORK — Joseph Goodman, Commissioner of Water Supply, Gas and Electricity, announced April 13 that his department had adopted a new rule covering air-conditioning systems in connection with the campaign to save water.

Effective on April 1 last for all new installations and on April 1, 1942, for existing installations, the rule provides that "no individual or collective air-conditioning system installed on any premises for a single consumer shall be permitted to waste annually more than the equivalent of a continuous flow of five gallons of city water per minute." The rule also provides that such installations using more than the stipulated amount of water shall be equipped with a water-conserving device. Mr. Goodman said that his department had no intention of shutting down the operation of air-conditioning and refrigeration plants unless the water shortage became acute and desperate.

USHA Monthly Rents Average $14

WASHINGTON—Average monthly shelter rentals of $14.08 per dwelling unit have been established for the 12,942 homes in the first 28 slum clearance and rehousing projects built and opened for occupancy under the sponsorship of the U. S. Housing Authority.

20th Century Fund to Study Housing

NEW YORK — A survey of housing needs as they present reemployment opportunities is being undertaken by a newly appointed committee of the Twentieth Century Fund, according to an announcement made March 4 by Evans Clark, executive director of the Fund. Miles L. Colean, Assistant Administrator of the Federal Housing Administration, will resign his Washington position to accept appointment as research director of the survey.

The Fund's investigation will attempt to determine how residential construction can be stimulated, with a view to contributing substantially to the restoration of a higher level of employment, meeting the recognized need for more adequate housing for the American people, and making more effective use of the country's available resources.

Dr. Henry E. Hoagland, Professor of Business Finance at Ohio State University, formerly Director of the Home Owners' Loan Corporation, and a former member of the Federal Home Loan Bank Board, is chairman of the committee sponsoring the survey. This committee, representing various interests and points of view, will review the findings of the research staff, and on the basis of these factual data, will present a program of recommended action.

Members of the committee, in addition to Dr. Hoagland, the chairman, are: Lillian M. Gilbreth, Professor of Management, Purdue University; Dr. Frank P. Graham, president, University of North Carolina; Henry I. Harriman, past president of the U. S. Chamber of Commerce; Arthur C. Holden, architect, of Holden, McLaughlin & Associates; John A. Lapp, publicist in labor relations, formerly chairman, Bituminous Coal Labor Board; Dr. William I. Myers, Head of Department of Agricultural Economics and Farm Management, Cornell University; and Sir Raymond Unwin, authority on British housing.

The Twentieth Century Fund was founded and endowed by the late Edward A. Filene to conduct non-partisan research into contemporary economic and social problems. It is administered by a board of trustees made up of representative leaders in various spheres of public and private authority.

Standards Set Up for Pipe Nipples

WASHINGTON — A commercial standard for brass, copper, steel and wrought iron pipe nipples, No. C85-40, is now the recorded standard for the industry, effective for new production May 10, according to an announcement by the National Bureau of Standards, United States Department of Commerce.

Monopoly Action Started on Coast Against Heating Contractors

LOS ANGELES—The Heating, Piping and Air Conditioning Contractors Association of Southern California, its officers, directors, and committee members, 11 heating and ventilating companies and 49 individuals affiliated with various firms were indicted by the Federal Grand Jury at Los Angeles March 27 on charges of conspiring to violate the Sherman Anti-Trust Act.

The majority of the men surrendered to the U. S. Marshal's office within a week after the true bills were returned. All were released on their own recognizance until April 25, when they were to be arraigned before U. S. District Judges Harry A. Holzer and Leon R. Yankwich.

The indictment was one of four against eight trade associations, four labor unions, 38 corporations and 161 individuals and came as the climax to a long secret investigation by a grand jury over a period of three months.

The indictment in the heating and ventilating industry reviews the various phases of its background and modus operandi and sets forth that the asserted violations of the Anti-Trust Act occurred throughout Southern California and dealt largely with Class A major construction.

The indictment charges that the defendants began their unlawful conspiracy in January, 1938, when they assertedly agreed as a part of the federation to:

(a) Arbitrarily increase costs of heating, piping, ventilating and air-conditioning equipment which had been shipped into the state in interstate commerce.

(b) Arbitrarily regulate, dictate and control the method of bidding and the performance of contracts awarded for the installation of equipment.

(c) Unlawfully suppress and restrain competition among members of the defendant association and eliminate competition by contractors in such activities who were not members of the defendant association.

(d) Unlawfully prevent contractors not belonging to the association from purchasing in interstate commerce heating, piping, ventilating and air-conditioning materials and equipment.

The true bill charges that the defendants established and enforced under penalty through a bid depository committee bidding rules and regulations that required all members to file bids, to general contractors or other awarding authority, in a bid depository; to submit bids to general contractors or other authorities only upon receipt of written request and to add to the price of bids for furnishing of such equipment any amount arbitrarily agreed upon.

OBI Elects Ray Whipple President

BUFFALO—Oil Burner Institute held its annual meeting April 2 at the Statler Hotel here and elected Ray G. Whipple of Harvey - Whipple, Springfield, Mass., as president for the coming year. Mr. Whipple succeeds Frank H. Dewey of Gar Wood who held the office for two years. Other officers elected were: first vice-president, E. P. Bailey of National Airoil; second vice-president, J. H. O'Brien of Petrol; and secretary-treasurer, C. F. Curtin.

Ray G. Whipple

C. E. Lewis of Delco was elected to the board of directors for three years. Other members re-elected to the Board for the same period were: Herbert Gillis of Branford, J. A. Lattner of Century, H. C. Little, J. H. O'Brien, J. H. Van Sciver of Bethlehem Doe, and C. B. Tamm of Heil.

Retiring President Dewey reported that the membership was stronger in numbers and influence than ever and that the Institute's budget was balanced. He referred to the strong position the industry had built and paid tribute to the confidence expressed by the industry in OBI.

A new schedule of dues for manufacturer members was unanimously approved with a minimum of $150 and maximum of $500. The scale is graduated on a basis of factory unit sales; the increased dues are made necessary by the cessation of expected income from another source.

The board decided to carry out the recommendations on advancement of Commercial Standards CS75-39 as approved at the industry meeting in Cleveland in January and endorsed by OBI at that time.

Attention was given to adverse legislation and the new licensing and bonding law in New York City was discussed at some length. Funds were voted for a study and interpretation of this bill and steps to be taken will receive the immediate attention of the executive committee and the legislative committee.

Warm Air Group Plans June Meeting

COLUMBUS—An invitation to all manufacturers, jobbers and dealers in the industry to attend the June Convention of the National Warm Air Heating and Air Conditioning Association has been issued by President C. A. Olsen. The convention will be held at the Palmer House, Chicago, June 3-5.

The subjects to be featured at the convention will be better merchandising, publicity and research reports.

Contractors to Meet in New York; Merchandising to be a Feature

NEW YORK—A talk on anti-trust laws and reports of the committees on welding, air conditioning, trade promotion, and standards, will be features of the fifty-first annual convention of the Heating, Piping and Air Conditioning Contractors National Association, to be held at the Hotel Pennsylvania here May 27-29. The program, is condensed form, follows:

MAY 27
a.m.

President's address—William J. Olvany.
Report of credential committee.
Address—George Masterton, general president, United Association of Journeymen Plumbers and Steam Fitters of the United States and Canada.
Address—"Anti-Trust Laws as Applied to the Building Trades"—Charles H. Tuttle.

MAY 27
p.m.

Report of secretary—Joseph C. Fitts.
Report of committee on trade promotion—Edwin P. Ambler, Chairman.
Address—"The Why of the Building Industry"—C. G. Norman, chairman, board of governors, Building Trades Employers' Association of the City of New York.
Report on Committee of Ten — Coal and Heating Industries—Harry M. Hart.
Report on Plumbing and Heating Industries Bureau—George H. Dickerson.
Report of committee on welding—Thomas I. Magan, chairman.

MAY 28
a.m.

Report of boiler output committee—Harry M. Hart, chairman.
Report of committee on standards—George P. Nachman, chairman.
Report of committee on air conditioning—J. Lawrence DeNeille, chairman.
Report of committee on apprenticeship—William V. Heier, chairman.
Address—Wilson Frankland, president, Steamfitters Protective Association.

MAY 28
p.m.

Report of committee on industrial relations—R. D. Berry, chairman.
Report of committee on certification—W. M. Smith, chairman.
Report of committee on fair trade practice laws—J. E. McNevin, chairman.
Election of Officers.

MAY 29
a.m.

WHAT TO SELL AND HOW TO SELL IT
Technical Research of the Industry.
The Institute of Boiler and Radiator Manufacturers—R. E. Ferry, general manager.
American Society of Heating and Ventilating Engineers—A. E. Stacey, Jr., chairman, committee on research.
Air Conditioning Manufacturers' Association.
Heating the Small Home.
Findings of committee on small house heating.
A Selling Program for the Industry.

A.C. Train Used for Centenary Trip

WORCESTER, MASS.—A train made up of air conditioned streamlined coaches and drawn by a "1400" class locomotive brought passengers to Norwich and Worcester from New London, Conn., and other points April 12. It marked the one hundredth anniversary of the founding of the Norwich & Worcester Railroad. A memorial tablet was dedicated at Norwich.

Radiator Heat Research Started by Manufacturers at Illinois

NEW YORK—The Institute of Boiler and Radiator Manufacturers has signed a contract with the University of Illinois for the construction and operation of a Research House at Urbana, Illinois, in the interests of radiator heat. It is hoped to have the house completed so that research can start by September.

Fourteen of the members of The Institute, who are manufacturers of cast iron boilers and radiators, have subscribed a total of $50,000 to cover the cost of constructing and equipping the house and assuring its operation for a minimum period of three years.

The purpose of this research program is first, to study the factors having to do with the installation, operation and maintenance of various types of heating systems, and, second, to study the factors pertaining to the atmospheric environment.

A six-room dwelling is being erected for use in studying the results obtainable with various types of installations, including, among other things, the following: (1) Operating characteristics, such as balancing of system; rate of heating up of rooms; systems of control; rate of heating up of units; (2) Costs and economies of operation; (3) Distribution of heat in all parts of house; floor to ceiling air temperature gradients; inside surface temperatures, and (4) Heat losses.

The extensive laboratory equipment of the University of Illinois will be utilized to supplement the work which will be carried out in the Research House, particularly in the development of technical data on radiator heat.

One important objective of the research program is to expedite the development of heating systems which will fit the restricted cost and space requirements of low cost residences.

Another important part of this program comprises a review of the work which has been done by other institutions and agencies in connection with the art of heating, the analysis of which will form a valuable background for the program to be followed.

The planning and carrying out of the program is in the hands of an Advisory Research Committee, consisting of: L. N. Hunter, chairman, National Radiator Co.; J. F. McIntire, United States Radiator Corp.; John P. Magos, Crane Co.; H. F. Randolph, International Heater Co.; and S. K. Smith, The H. B. Smith Co.

The signing of the contract indicates the confidence of the industry in the value of the results from research at Illinois. The work done by the University for the warm air heating industry, dating from 1915, has been of great value to that group.

Predicts 125,000 Stoker Sales in '40

DETROIT—There is a great need for complete stoker-boiler and stoker-furnace units, according to Marc G. Bluth, secretary of the Stoker Manufacturers Association, who addressed The Detroit Coal and Stoker Institute recently. Looking into the future, Mr. Bluth foresees:

An increasing number of so-called "stoker manufacturers" discontinuing the line; diversification of business by stoker manufacturers in developing a general line of heating equipment; need for more extensive research work on fundamental principles of coal combustion and classifications of bituminous coals as applied to small underfeed stoker firing; need for mechanical or automatic removal of bituminous coal ash, but recognition by all interests concerned of the fundamental problems and obstacles encountered in the designing, developing and marketing of such equipment; 125,000 stoker sales in 1940; increasing need for an industrial training program for installation and service men; recognition of the value of local cooperative advertising and sales promotion efforts between coal retailers and stoker dealers; expansion of national advertising and sales promotion efforts, particularly by the National Coal Association, which is already engaged in such activity and has been for the past two years; importance of personnel and manpower and intelligent supervision and training of salesmen and mechanical men.

Slayter to be Honored by Institute

PHILADELPHIA—Games Slayter, Newark, Ohio, who invented the process for transforming glass into thread-like fibers, is to be awarded an Edward Longstreth Medal during the annual Medal Day exercises of The Franklin Institute. The medal is given, "in recognition of meritorious work in science and the industrial arts," on the recommendation of the Institute's Committee on Science and the Arts.

Mr. Slayter is vice-president of Owens-Corning Fiberglas Corporation. Toledo, Ohio, and is in charge of research and development. At least eight principal United States patents in the Fiberglas field have been issued in his name.

Committee Collecting Code Data

SEATTLE—R. O. Wesley, president of the Pacific Northwest Chapter of the ASHVE is gathering extensive data through a survey, now under way by a special committee which will make recommendation as to what action the local chapter should take in connection with heating and ventilating provisions of the Seattle building code. M. J. Hauan is chairman of the committee.

Pittsburgh Group to Back Research on Hospital Air Conditioning

PITTSBURGH — The regular monthly meeting of the Pittsburgh chapter of the ASHVE was held April 8, with F. C. McIntosh presiding. His opening discussion dealt with a proposal for the chapter to sponsor a project for the Research Laboratory. The proposed project is to deal with the study of air conditioning to determine the requirements in hospital operating rooms.

F. C. Houghten, director of the Research Laboratory, gave a resume of past studies on hospital air conditioning in many cities. Since the Laboratory is located in Pittsburgh and some hospital studies have already been made at the Magee Hospital, with this experience it is logical to conduct these studies here.

Dr. M. B. Ferderber and Dr. John W. Shirer later spoke on the need of such a study, speaking from a physician's and surgeon's viewpoint. They pointed to the psychological preparations and requirements of preoperative and postoperative treatment of patients. All this is sometimes defeated when a surgeon has to operate on a patient, say in July and August, when the outside temperature is around 100F. There are many factors that come up, such as shock, loss of blood, particular effects of diseases, perspiration of patients. Dr. Shirer pointed to the routine procedures that are followed because no new or better methods are known.

The chapter approved the task of its raising the sum of $1500 as part of the cost to cover the carrying out of this project.

The last speaker of the evening was Paul D. Close of Chicago. His subject was "Heat that Hesitates". The subject dealt with the insulation of buildings and was illustrated with slides.

Stoker Builders Plan June Meeting

CHICAGO—E. C. Sammons, president of the Stoker Manufacturers Association, announced on April 12 appointment of the following members to serve on the annual meeting committee: J. M. McClintock, chairman, Illinois Iron & Bolt Company; H. L. Bilsborough, Fairbanks, Morse & Company; C. M. Lewis, Anchor Stove & Range Company; and John Munro, Whiting Corporation.

The committee will meet in Chicago soon to prepare a program for the annual meeting, to be held at Hot Springs, Virginia, June 6-7.

It is the plan this year to devote the major part of the program to merchandising and sales problems. It is expected that an outstanding speaker on merchandising will be engaged.

ASHVE Will Study Corrosion from Spray Water in A.C. Systems; Forced Hot Water Pipe Sizes to be Investigated

NEW YORK—Pipe sizes for forced hot water heating systems and corrosion in connection with spray water in air conditioning systems are two subjects demanding research investigation, according to A. E. Stacey, Jr., chairman of the ASHVE committee on research. Committees have been appointed to study both of these subjects.

A report of progress showing relative resistance of several alloys to corrosion when hung in an air stream or when submerged in an inhibited spray water is being prepared by the technical advisory committee on corrosion composed of A. R. Mumford, New York, chairman; H. E. Adams, Norwalk, Conn.; J. F. Barkley, Washington; L. F. Collins, Detroit; W. H. Driscoll, New York; T. J. Finnegan, New York; W. Z. Friend, New York; R. R. Seeber, Houghton, Mich.; F. N. Speller, Pittsburgh, and J. H. Walker, Detroit.

In addition, tests are being arranged to study the protective power of several recently developed resistant coatings. These coated specimens will be exposed both to the air and by submergence in the spray water of the same system that was used for the uncoated metals. Also duplicates will be similarly exposed to a system which has had the greatest difficulty from attack on metal that is available and accessible to the committee.

With plans for huge housing developments requiring more accurate engineering data on the frictional resistance of large pipe sizes, a research technical advisory committee on flow of fluids through pipes and fittings has been appointed with S. R. Lewis as chairman. Although the immediate plans of research activity are to study hot water flow it is anticipated that this committee will also consider in the future such fluid flow problems that deal with air and steam.

At the present time piping systems designed for hot water heating rarely make any allowance for increased resistance to flow or for progressive reduction in capacity due to roughening of an originally smooth interior or for constriction by mud and scale.

Tests conducted at the Society Research Laboratory in Pittsburgh some years ago disclosed that little difference exists between resistance to the flow of fluid in steel or copper pipes because of their same relative smoothness, but that resistance increases rapidly if the interior surface is roughened for any reason. Data on sizing hot water piping for heating given in the *Guide* were developed as the result of investigations on comparatively small pipes and there has been no evidence but that these data are conservative. However, with the rapid increase in use of large hot water heating systems it seems desirable to restudy the frictional resistance for pipe sizes larger than 6 in. in diameter.

Arrangements have been made to conduct the first experimental investigations under a cooperative agreement between the ASHVE and Texas Agricultural and Mechanical College, where Dr. F. E. Giesecke, now president of the Society, will personally supervise the research program.

Other members of the committee who are responsible for outlining and supervising this work are: L. A. Cherry, Buffalo; G. C. Davis, Winnipeg; T. M. Dugan, McKeesport, Pa.; Earle W. Gray, Oklahoma City; R. T. Kern, Fitchburg, Mass.; H. A. Lockhart, Chicago; Axel Marin, Ann Arbor, Mich.; R. F. Taylor, Houston, and E. L. Weber, Seattle.

Smoke Abatement Reported in N.J.

JERSEY CITY, N. J.—"The industries of Hudson County have made an excellent showing in smoke abatement," according to William O. Christy, smoke abatement engineer of Hudson County, in releasing his annual report. During the year 1939, county smoke inspectors made 26,325 observations of stationary plant chimneys and saw only 118 violations of the smoke ordinance. The violations constituted only 0.45% of the observations.

During the year 1931, the first year the Department of Smoke Regulation was in operation, there were 547 stationary plant violations out of 5,987 observations. This figures out as a 92% improvement during the year 1939, as compared with 1931. The department's classification of stationary plants includes heating plants also, but most of the observations and violations were on industrial plants.

All the records made by the Department of Smoke Regulation indicate that over 90% of the smoke formerly made in Hudson County has been eliminated. This has all been accomplished by cooperation. Owners and operators of industrial plants, locomotives and marine vessels have cooperated wholeheartedly in most instances. This has not only eliminated a lot of smoke, but has resulted in saving large amounts of fuel for the fuel users of the county.

New Industrial Building Up 97%

NEW YORK—Contracts for industrial building for the first quarter of 1940 are 97% higher than during the same period in 1939, according to *Engineering News-Record.*

Max Paul Miller

BALTIMORE—Funeral services for Max Paul Miller, 61, heating and ventilating engineer and Baltimore representative for Warren Webster & Company, were held here April 10. He died from a heart attack after an illness of several months.

Mr. Miller joined Warren Webster & Company at Camden in 1900, with the engineering department. In 1927 he took charge of the Baltimore territory.

Surviving him are his widow, two daughters, two brothers, and a sister.

William A. Mills, Sr.

PORT CHESTER, N. Y. — William Abendroth Mills, Sr., retired foundry owner, died April 21 at the age of 71. About three years ago he suffered a stroke from which he never recovered.

Mr. Mills was born in Jersey City. He was president of the Abendroth Brothers Foundry at Port Chester from 1901 to 1905. In 1906 he organized the Globe Foundry Company in this village, which was destroyed by fire in 1911. After that Mr. Mills was connected with various foundry companies.

Walter J. Kohler

KOHLER, WIS.—Walter Jodok Kohler, manufacturer of plumbing and heating equipment and Governor of Wisconsin in 1929-30, died unexpectedly April 21 at the age of 65 in his home, Riverbend. He had appeared to be in good health.

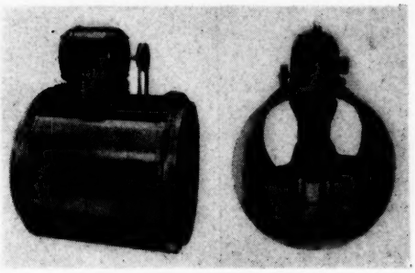
Mrs. Kohler found his body on the floor in his bedroom. It was believed he died just after he arose in the morning to dress. Death was due to a coronary embolism.

Mr. Kohler, chairman of the board of the Kohler Company, was born March 3, 1875, in Sheboygan, where he attended the public schools. When he was 15 years old he went to work in the enameling department of the Kohler Company, founded in 1873 by his father.

When his father died in 1900 the three Kohler brothers carried on the business. Four months later the plant burned to the ground, but within a year construction had begun on a new factory. Mr. Kohler became president in 1905, serving until 1937, when he became chairman of the board.

He leaves a widow, the former Charlotte Schroeder of Kenosha, Wis., and four sons, John Michael, Walter J., Jr., Carl J. and Robert E. Kohler. Also surviving are a brother, Herbert Vollrath Kohler, president of the company; three sisters, the Misses Marie, Evangeline and Lillian Kohler of Sheboygan, and nine grandchildren.

NEW EQUIPMENT



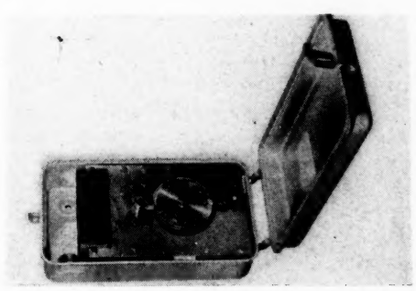
For handling contaminated air.

Wing Exhaust Fan

NAME—Straight-Line Exhaust fan.
PURPOSE—For moving air containing steam, dirt, fumes, paint, or similar materials.
FEATURES—Exhaust fan is equipped with Wing-Scruplex propeller fan which delivers large air volumes against duct or wind resistance. Motor is located outside of the air duct to keep it clean and cool and to reduce fire hazards when the air mixtures being exhausted are inflammable or explosive. Unit is available in horizontal or vertical design and is equipped with a belt drive to permit the selection of fan speed to fit any condition of air volume and resistance.
LITERATURE AVAILABLE—Bulletin EX 400.
MADE BY—*L. J. Wing Mfg. Co., 154 West 14th St., New York, N. Y.*

Paragon Timers and Relays

NAME—Paragon series of automatic re-set timers and time delay relays.
PURPOSE—For time control of air conditioning equipment.
FEATURES—These instruments can be used for the following purposes: (1) To close and then reopen a circuit; (2) to open and then reclose a circuit; (3) to make a momentary contact; (4) to repeat a preset schedule of momentary contacts or timed "on" and "off" operations, and (5) to reset instantaneously after a power failure. Timers are furnished with eight terminals.
MADE BY—*Paragon Electric Company, 37 West Van Buren St., Chicago, Ill.*

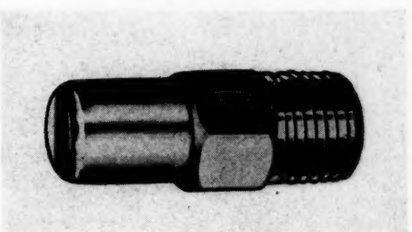


For time control.

Fairbanks, Morse Gas Engine Condensing Unit

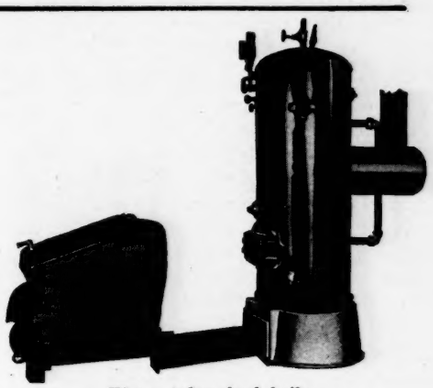
NAME AND MODEL NO.—Gas engine driven Freon condensing unit, FNK—1000 W.
PURPOSE—For supplying refrigeration for air conditioning systems in localities where natural gas is more economical than electric power.
FEATURES—The standard unit consists of a 6 cylinder engine mounted on a common base with an 8 cylinder V-type compressor and a multiple shell and tube type condenser. Compressor is direct driven through a centrifugal coupling and the entire assembly is mounted on a rubber cushion to reduce vibration. Engine is fully water jacketed the length of the bores and exhaust valve seats are cooled by direct circulation of water from the header pipe. Full force-feed lubrication by a positive gear pump assures adequate lubrication and efficiency and all operating parts are super-finished. Compressor heads are cooled by condenser water. The condenser is arranged for counterflow of refrigerant and water.
SIZES AND CAPACITIES—7½ and 10 tons at present with 3 larger sizes to follow.
MADE BY—*Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.*

Spraying Systems Nozzle



Type U flat spray nozzle.

NAME—Whirljet corrosion resistant nozzle.
PURPOSE—For spraying corrosive liquids.
FEATURES—Nozzles are for use in various industrial and mechanical processes, as well as in air conditioning applications. They are available in brass or iron, hardened steel, stainless steel, monel metal, lead, hard rubber and other materials as required. Nozzle is said to produce a hollow cone spray with uniform distribution. Manufacturer states that they have large passages making them practically clog proof.
SIZES AND CAPACITIES—Pipe connection is ⅜-in. male, and capacities range from 0.5 to 2.5 gal. per min. at 10 lb. pressure.
MADE BY—*Spraying Systems Co., 4021 W. Lake St., Chicago, Ill.*



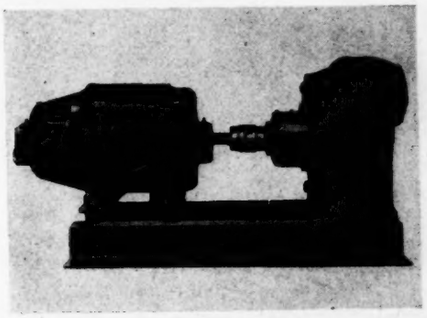
Kisco stoker fired boiler.

Kisco Stoker Fired Boiler

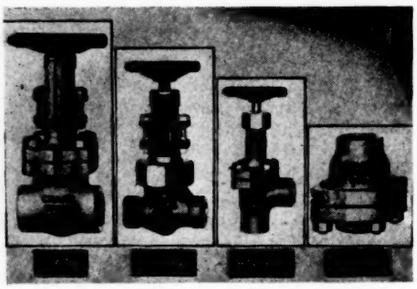
NAME—Kisco stoker fired boiler.
PURPOSE—For supplying steam or hot water using stoker fired coal as a fuel.
FEATURES—Boiler and stoker unit incorporates a specially designed stoker and combustion chamber which is fitted with Kisco tuyeres. These are designed to supply secondary preheated air to consume practically all of the gases. Unit is also equipped with Kisco new "efficiency booster" which is a miniature horizontal boiler assembled in a steel housing at the smoke outlet of the boiler and is connected to the boiler proper with circulating pipes. Manufacturer states that this device reduces stack losses and improves circulation.
MADE BY—*Kisco Boiler & Engineering Co., 3732 Chouteau Ave., St. Louis, Mo.*

B & G Hot Water Pumps

NAME—B & G belt driven pump and B & G universal type pump.
PURPOSE—For circulating water in forced hot water heating systems.
FEATURES—The belt driven pump is designed for head pressures up to 25 ft., and is available in two capacities, with ½ hp. and ¾ hp. motors, respectively. These units are equipped with 3 in. connections. Universal type pump is designed to handle head pressures up to 90 ft.
MADE BY—*Bell & Gossett Co., 3000 Wallace St., Chicago, Ill.*



B & G Universal type pump.



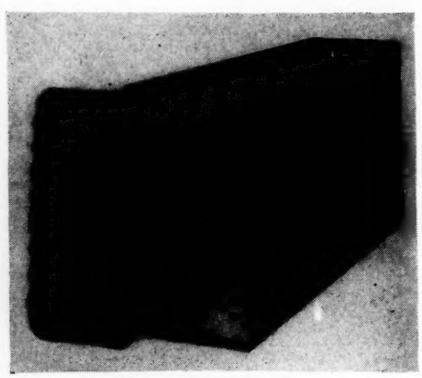
For pressures up to 600 lbs. steam.

Crane Steam Valves

NAME—Crane steam valves.
PURPOSE—For controlling the flow of steam and oil at pressures up to 600 lbs.
FEATURES—This line of valves includes gates, globes, angles, and checks. Valves are available in sizes ¼ to 2 in. inclusive and in both inside screw and O.S. and Y. construction, union, and bolted bonnet with screwed, socket weld, and flanged end types. The gate valves are made of cast steel while globe and angle valves are made of forged steel, and the check valves are made of forged steel in horizontal patterns, and cast steel in vertical ball patterns. Casting for these valves are made from steel which is melted by high frequency induction methods and the castings are inspected by periodic x-ray and gamma ray radiographic methods. Manufacturer states that as a result of the applications of these advanced methods the Crane radio-cast steel complies with the A.S.T.M. specification A-216, covering high grade carbon steels.
MADE BY—*Crane Company, 836 S. Michigan Ave., Chicago, Ill.*

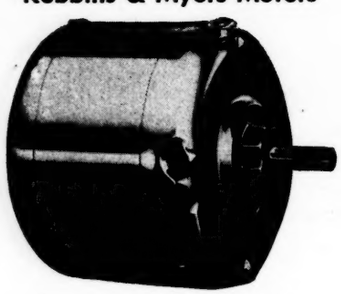
Modine Cooling Coils

NAME—Cleanable and continuous tube cooling coils.
PURPOSE—For air conditioning using water as a cooling or heating medium.
FEATURES—The cleanable type coils are designed for use where cooling water conditions are such that cleaning of tubes will be necessary. The continuous tube type coils are designed for use where there is no possibility of dirt depositing on the inside of tubes to restrict water flow. Flow mixers are inserted in each tube of both coils to promote turbulence of the water as it flows through the tube. Various arrangements of water circulation are available without external piping connections and coils may be ordered with built-in provision for water counterflow for each single row of tubes or each double row of tubes. The cleanable type cooling coil is designed so that the entire header can be removed by taking off a number of hexagonal nuts which secure header to the casing. After the header is removed the flow mixers can be withdrawn and a wire brush can be inserted for the cleaning. Other features include: provision for expansion and contraction of the core, fins designed for directional air flow, and metallic bonding of fins to the tube.
SIZES AND CAPACITIES—Available with either cleanable or continuous tube types in 3 widths and 13 lengths, ranging from 2 ft. 8½ in. to 10 ft. 8½ in., and two depths, 4 rows and 6 rows of tubes.
LITERATURE AVAILABLE—Catalog No. 540.
MADE BY—*Modine Manufacturing Co., Racine, Wis.*



Modine cleanable type coils.

Robbins & Myers Motors



Sizes from 1/300 to 1/20 hp.

NAME—Type K shaded pole motors.
PURPOSE—Light duty motors primarily intended for fan use.
FEATURES—These motors are available in sizes from 1/300 to 1/20 hp. and the manufacturer states that the variety of ratings between these two extremes is unusually large. Motors are available at both 2 and 4 pole speeds for 50 and 60 cycles and for 2 pole speeds (1275 r.p.m.) for 25 cycles. Entire line is available in both normal and high torque designs. The latter type is said to give 50% more starting torque than the usual design of shaded motor. All ratings are available in the same body diameter and are designed for either ball or sleeve bearings. Frame modifications include open or enclosed construction, round body, flat base or resilient mounting. For fan duty applications a separately mounted speed control unit is available.
MADE BY—*Robbins & Myers, Inc., Springfield, Ohio.*

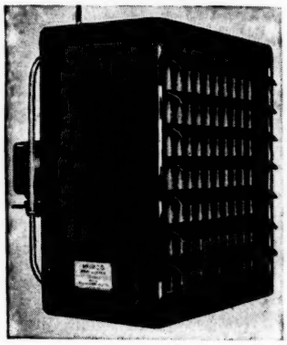
Made of aluminum alloy.

Truflow Wall Forms

NAME—Truflow fans.
PURPOSE—Propeller type fans for moving air.
FEATURES—These wall type fans are of aluminum alloy construction. Sizes 12 to 36 in. in diameter, employ 4 blade propellers while the 42 to 48 in. diameter sizes use 6 blades. The accompanying illustration shows a 30 in. diameter, 4-blade propeller fan, commonly used for exhaust purposes. The frame and propeller blades are both made of high tensile aluminum alloy, each cast in one piece. Wheel is mounted directly on the motor shaft. Motors available for single and variable speeds, and horizontal or vertical mountings. Speeds of the larger fans range from 340 to 860 r.p.m. and the smaller ones from 715 to 1750 r.p.m.
CAPACITIES—Up to 40,000 c.f.m.
MADE BY—*The Truflow Fan Company, 522 Main St., Harmony, Pa.*

Murray Unit Heater

NAME—Murco unit heater.
PURPOSE—For space heating.
FEATURES—Heating elements have heavy wall copper tubes and fins of the latest design. Condenser is full floating to overcome contraction and expansion. The unit is equipped with a unit heater duty totally enclosed motor. Case has a crackle finish, trimmed with chromium strips.
MADE BY—D. J. Murray Mfg. Co., Wausau, Wis.

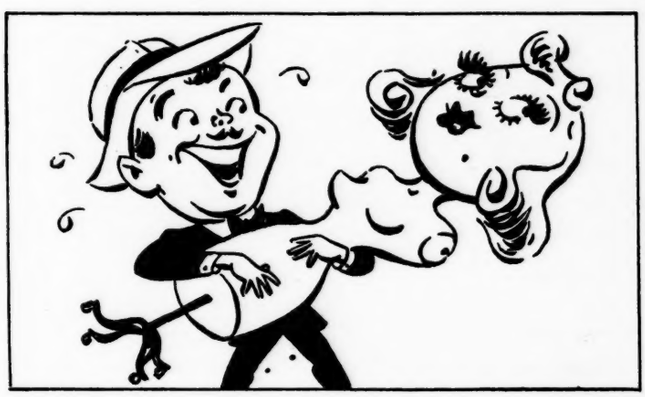


For space heating.

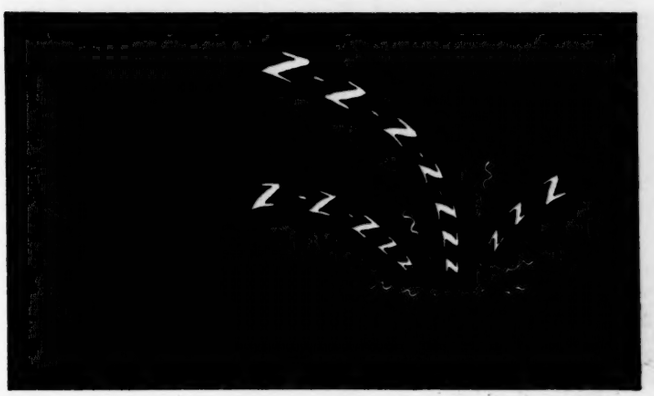
Data sheet for your new air conditioning installation

1 You'll get a hand from the plant workers, when they hear you're installing air conditioning! Besides increasing their comfort, you're stepping up their normal efficiency. Pat on the back for *you,* Mr. Plant or Maintenance Engineer!

2 When you choose your air filters for the new system, pick the ones that mow down dirt—efficient Dust-Stops.* Capacity: 2 CFM per sq. in. of area at 300 FPM. Resistance: (in inches of water gauge per inch of depth) 0.045 to 0.050 clean to 0.11 to 0.12 dirty.

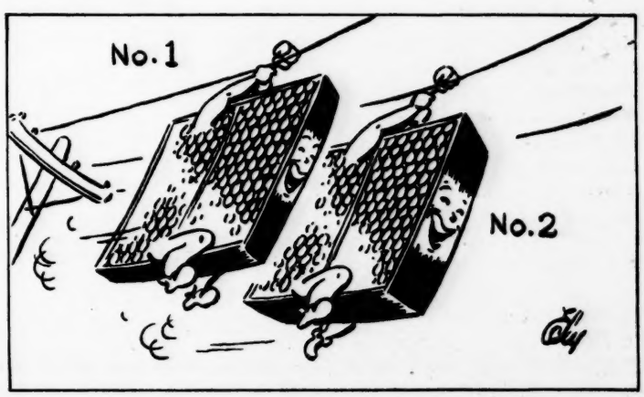


3 And brother, the upkeep is low! Dust-Stops cost approximately 1-cent per CFM to install, including frames; about 1/10th-cent per CFM, when filters need changing. Compare these costs with those on permanent and mechanical filter installations!



4 Sleep soundly at night, secure in the knowledge that Dust-Stops are safer. The all-glass Fiberglas* filtering medium and the patented adhesive *will not support combustion.* Now look at the next picture for another outstanding Dust-Stop advantage!

5 Unlike changing a baby, no skilled labor is required to change Dust-Stops. These filters eliminate cleaning, charging, draining, expert supervision, and the need to keep a supply of spares. Dust-Stops fit all types of air handling systems.



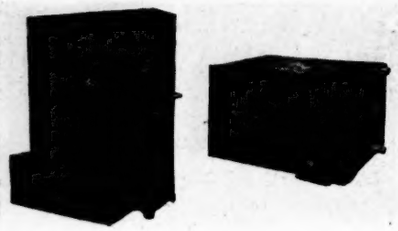
6 Phone for new Dust-Stops from your air conditioning manufacturer, jobber or dealer of this equipment. You get your supply of No. 1 (1-inch) or No. 2 (2-inch) at a moment's notice. So, how about it, Mr. Chief Engineer? Specify replaceable Dust-Stops in your air conditioning installation!

FIBERGLAS* DUSTOP* AIR FILTERS

*T. M. REG. U. S. PAT. OFF.

Made by Owens-Corning Fiberglas Corporation, Toledo, Ohio

DIRECT CANADIAN INQUIRIES TO FIBERGLAS CANADA, LIMITED, OSHAWA, ONTARIO



Two to thirty tons in cooling.

Kramer Air Conditioning Units

NAME—Kramer air conditioning units.
PURPOSE—For year 'round air conditioning.
FEATURES—Units are of the complete cabinet type furnished for either floor or ceiling mounting. The coils used in these units are of the Turbofin type of all copper construction with the fins bonded to the tubes by metallic fusion. The cabinet is made of heavy gauge steel with the cabinet of the larger units made in three or more sections to allow for portability and accessibility. Cabinets are lined with sound deadening and heat insulating material. Fans are of the centrifugal type, while the motors are rubber mounted outside the unit on an adjustable base. Filters are of the standard fibre-glass type.
SIZES AND CAPACITIES — Sizes range from 2 to 30 tons in cooling and 65,000 to 1,280,000 B.t.u. per hour in heating.
MADE BY—*Kramer Trenton Company, Trenton, N. J.*

Hoppe Solenoid Valve

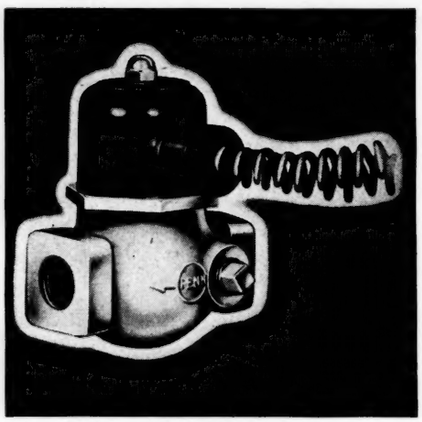
NAME—Type D solenoid valve.
PURPOSE — For severe service on steam, water, oil, air, or gas lines.
FEATURES—Body and cap of this valve are forged from No. 4 carbon-molybdenum steel. The cap is held with triplex steel bolt studs. Solenoid is of glass insulated wire designed to withstand temperatures of 1000F. The valves are designed to operate on 1250 lb. steam, 800 lb. oil at 900F, or 3000 lb. cold water, oil, or gas non-shock. Sizes are ½ to 2 in. in either horizontal or angle type, screwed or flanged ends. Also available with union cap in sizes from ¼ to 2 in.
MADE BY — *Hoppe Engineering Co., Indianapolis, Ind.*

Durakool Mercury Relay

NAME—Durakool mercury relay.
PURPOSE—For making and breaking electrical circuits.
FEATURES—This relay is of the mercury type and is encased in an unbreakable, hermetically-sealed metal body. Manufacturer states that the relay is especially suitable to use in corrosive or explosive atmospheres and that its construction eliminates the risk of breakage in shipment or operation. The metal body contains a gas at a pressure of 4 atmospheres which is said to help in the reduction of ionization between contacts. The contact resistance is said to be as low as .002 ohms.
SIZES—Available for special requirements up to 200 amperes capacity.
MADE BY—*Durakool, Inc., 1010 No. Main Street, Elkhart, Ind.*

Penn Solenoid Gas Valve

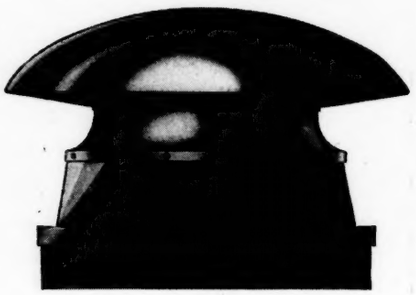
NAME—Penn solenoid gas valve.
PURPOSE—For controlling the flow of gas to gas-fired units.
FEATURES — Valves are provided with a brass valve seat and with a special oil treated meter sheepskin disc. It is stated that this construction assures a permanent tight seal unaffected by metal particles or the hammering of repeated operations over a long period of time. Valves close in the direction of the gas flow to further insure a tight seal. Valves are regularly supplied as standard automatic valves but may be had at no extra cost with semi-automatic button when so specified.
SIZES AND CAPACITIES—From ¼ to 1 in. I.P.T. with capacities from 25 cu. ft. per hr. to 435 cu. ft. per hr. based on gas of 0.6 specific gravity at ½ in. water pressure drop.
MADE BY—*Penn Electric Switch Co., Goshen, Ind.*



For controlling gas flow.

DeBothezat Roof Ventilator

NAME—Power-flow roof ventilator.
PURPOSE—For supplying ventilation at all times' independent of weather conditions.
FEATURES—Ventilator is said to move a large volume of air per horsepower while maintaining low tip speeds. This is said to result in quiet operation and increased efficiency. The fan is designed with non-overloading power characteristics to protect against burned out motors. A patented "log cone" entrance ring is provided to reduce entrance eddy losses. Ventilators are available in a large range of sizes and capacities.
LITERATURE AVAILABLE—Bulletin PRV.
MADE BY—*DeBothezat Ventilating Equipment Division, American Machine and Metals, Inc., East Moline, Ill.*



Ventilation independent of weather.

Minneapolis-Honeywell Thermostat

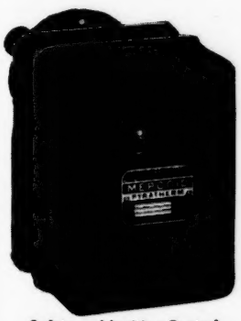
NAME — Two-stage Thermostat, M-H T802.
PURPOSE—A low voltage thermostat designed to control the "hi-low" or "hi-low-off" flame sequence provided by some types of gas or oil burners.
FEATURES—Two circuits, closing in sequence on temperature fall are provided—one controls the high, the other the low fire valve—and both are actuated by the same bi-metal element and magnet. This design is said to prevent the device from getting out of step and to assure proper operating sequence. The use of snap action open contacts is said to eliminate the need for critical leveling on the wall. This thermostat has a standard operating range of 54 to 86F with a non-adjustable differential ¾F on low stage and 1¼F on high stage. The high stage "makes" 1½F below the low stage.
MADE BY — *Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.*

Russell Ozone Generator

NAME—Ozonator.
PURPOSE—For introducing ozone into room air.
FEATURES—This device is a small cylindrical unit which produces ozone by electrical discharge and is designed to be attached to the upright member of a circulating fan or fastened to a wall. Capacity is 40 cubic centimeters of ozone per hour. The housing is made of metal, chromium plated, and unit is equipped with a 10 ft. rubber covered cord ready to be plugged into any standard 110 volt AC circuit. Ozonator is 6 in. x 3¼ in. in diameter, weighs 3½ lb. and is said to have a current consumption of less than 10 watts.
MADE BY—*Russell Electric Company, 340 W. Huron St., Chicago, Ill.*

Mercoid Sensatherm

Mercoid Pressure Control



Safety and Ignition Control

THERE IS TROUBLE—

because this cockeyed world is out of control

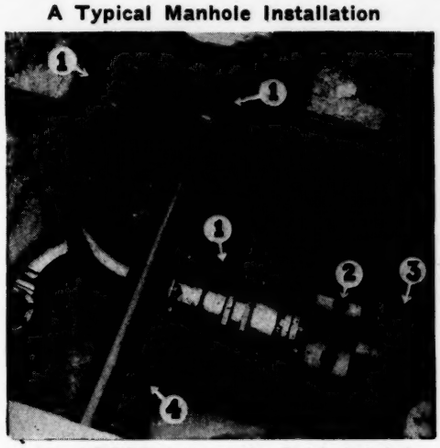
The same thing happens to an oil burner, stoker or air conditioning system, unless it is governed by controls that keep the automatic heating system in orderly check under all operating conditions. In this respect, Mercoid Controls qualify 100%. They have established an outstanding record of unfailing performance, which merits the attention of all who realize the importance of installing controls that assure trouble-free service. Mercoid Controls are "*built to endure.*" That is one of their outstanding characteristics. • Every Mercoid Control is designed and constructed with the utmost precision. They have a number of exclusive patented features that insure positive and accurate operation. The simplified means for setting the operating adjustments and ease of installation, are appreciated by service men. The Mercoid hermetically sealed mercury contact switch is the distinguishing feature of all Mercoid Controls. A much cheaper switch could be used, but it would not offer the same protection against dust, dirt or corrosion, and it would not be as long lived. Mercoid Controls give you this important added switch protection. • Summing up all facts and experiences, Mercoid Controls are the best control value on the market today. • Write for complete catalog giving detailed information. If you have a control problem, Mercoid will solve it.

THE MERCOID CORPORATION • 4231 BELMONT AVE. • CHICAGO, ILL.

ADSCO INTERNALLY GUIDED JOINT

A COMPACT, EASILY INSTALLED JOINT FOR HIGH OR LOW PRESSURES

A Typical Manhole Installation



(1) ADSCO Internally Guided Joints in manhole under construction (2) ADSCO Insulation Support (3) ADSCO Pipe Alignment Guide and (4) ADSCO Empire Steam Trap.

Can be specified with Confidence for years of Efficient Operation —Hundreds in Daily Use.

An internal guide on the inner end of the slip provides true axial movement throughout entire slip traverse. No metal to metal contact between polished slip surface and body. Slip cannot pull out of the joint. A compact joint for restricted space — largest diameter is the flange.

Available in single or double joints in semi-steel or cast steel for high pressures and high temperatures with flanged or beveled ends.

Write for Bulletin No. 35-30V.

Sectional View of Joint

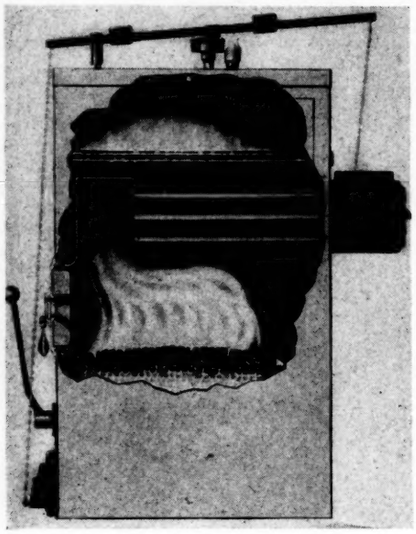
A Few Users

Cons. Gas, Elec. Lt. & Pr. Co. Baltimore, Md.
Philadelphia Electric Co. Philadelphia, Pa.
Atlanta University Atlanta, Ga.
Moose Lake State Hospital Moose Lake, Minn.
Olds Motor Works Lansing, Mich.
Union Pacific R. R. Co. Council Bluffs, Ia.
U. S. Navy Yard Brooklyn, N. Y.
Wards Island Sewage Works Wards Island, N. Y.

AMERICAN DISTRICT STEAM COMPANY

NORTH TONAWANDA N.Y.

IN BUSINESS OVER SIXTY YEARS



Hand fired residential steel boiler.

Fitzgibbons Boiler

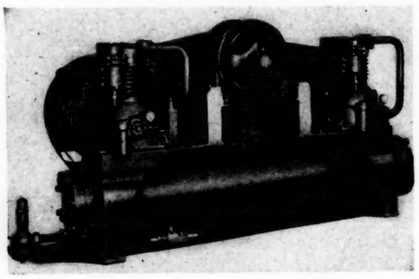
NAME AND MODEL NO.—Fitzgibbons hand fired boiler, series 400.
PURPOSE—A hand fired boiler for residential heating.
FEATURES—Manufacturer states that this boiler is constructed of electrically welded copper steel and may be readily converted to oil, gas, or stoker firing. Boilers are equipped with a submerged tank heater to provide domestic hot water for a storage tank. Other features include circular grate, gas and dust tight doors, enameled steel jacket, and standardized location for heat controls. Models for steam, hot water, vapor, and vacuum type systems.
SIZES AND CAPACITIES—Four sizes with capacity range from 260 to 550 sq. ft. steam net load.
MADE BY—*Fitzgibbons Boiler Company, Inc., 101 Park Ave., New York.*

Magnet Room Thermostat

NAME—Magnet Featherweight room thermostat No. 19.
PURPOSE—For controlling the temperature of room.
FEATURES—Manufacturer states that since this thermostat has a weight of only 1¾ oz. and that the thermostat is well ventilated, it will respond quickly to changes in temperature. It is further stated that the thermostatic bar is freely exposed to air passage and that there is a vertical ventilating air space and bakelite insulator between the thermostat and the wall. Thermostat is said to be accurate within 1F, to have a differential of 2F and a range from 60 to 80F. The action is magnetic—quick make and break.
MADE BY—*Magnet Switch Company, 356 W. Huron St., Chicago, Ill.*

Universal Condensing Units

NAME—Universal air conditioning condensing units.
PURPOSE—For supplying refrigerating effect in air conditioning systems.
FEATURES—The 1940 line features streamline bases, new uniform belt guards and sensitive water valves mounted at the base of the condenser inlet connection. Bi-metal overload protection is incorporated in the motor on all units through 1 hp., eliminating the necessity of any overload coils in the control. All controls are mounted directly to the base. Two new units, W 2000-FH and W 2500-FH rated at 20 hp. and 25 hp., respectively, have been added to the line. All units are designed for use with Freon.
SIZES AND CAPACITIES—Eleven sizes ranging from ¾ to 25 hp.
MADE BY—*Universal Cooler Corporation, Detroit, Mich.*



Universal 25 hp. condensing unit.

Westinghouse Oil Heater

NAME—Special Flange Head Oil Immersion heater.
PURPOSE—For heating oil using electricity as an energy source.
FEATURES—This oil heater is designed for use on high pressure systems. The heater tubes are of steel, silver soldered into a cast iron head and the units are made both for circulating and non-circulating systems. Non-circulating heaters have a rating from 1 to 3 kw. for 115 or 230 volts, with two heater tubes ranging in length from 14⅞ to 37⅞ in. The circulating heaters have either two or four heater tubes 33⅜ to 37⅞ in. length with a rating from 5 to 8 kw. for 230 volts.
MADE BY—*Westinghouse Electric & Manufacturing Company, Mansfield, Ohio.*

General Gas Control

NAME—General Controls automatic gas control series B-60-6.
PURPOSE—A gas control for regulating gas fired equipment.
FEATURES—Device consists essentially of a gas actuated gas valve, a pilot burner generator and a thermostat which is either built integral with the gas valve or of the remote type. In both cases, night cut-off is available. In the case of the water heaters, automatic control is obtained by the use of a tank thermostat. In operation the valve is gas actuated and no electrical current is required from an external source as all current necessary to operate the valve is furnished by the pilot burner generator. Boiler flame failure causes the gas valve to close in safe position. Controls are designed for natural, manufactured and butane gas.
LITERATURE AVAILABLE—Bulletin S 230.
MADE BY—*General Controls Company, Glendale, Calif.*

Randall Pillow Blocks

NAME—Randall one-piece steel housing pillow block.
PURPOSE—A low priced pillow block.
FEATURES—Bearing is of one-piece steel housing type designed to handle shafts of 1 1/16 to 1 5/16 in. diameters. Features claimed include quiet operation, selective mounting positions, constant self-alignment, self-lubrication and one-third less weight. The assembly consists of three parts, the one-piece steel housing, a machined cast iron ball with large oil reservoir, and a patented bronze bushing with graphite filled grooves to provide lubrication.
MADE BY—*Randall Graphite Products Corp., 609 W. Lake Street, Chicago, Ill.*

Thrush Tempering Valve

NAME—Thrush tempering valve.
PURPOSE—For providing correct temperature domestic hot water.
FEATURES—Valve is said to be low in cost and thermostatically controlled. An external adjustment is provided so that the valve will supply any temperature water up to the temperature of the hot inlet water. The thermostatic element is located in the mixing chamber and is designed to immediately compensate for any changes in temperature. It is said to be not affected by variations in pressure. Entire thermostatic element can be removed without disconnecting the piping.
SIZES AND CAPACITIES—½, ¾, 1, 1¼, 1½ and 2 inches.
MADE BY—*H. A. Thrush & Company, Peru, Indiana.*

For providing correct temperature hot water.

▸ *Why You Should Use* ◂

RIC-WIL Insulated Pipe Units

STABILITY
STRENGTH
SIMPLICITY
REAL PIPE SUPPORT AND GUIDE SCREW INTO CONDUIT — REMOVABLE
PIPE AND ITS COVERING FREE FROM ANY LOAD ON THE CONDUIT
HEAVY ASPHALT SHELL IS OUTSIDE OF AND SUPPORTED BY STRONG ARMCO CONDUIT
CROSS SECTION
DURABLE WATERTIGHT ENGINEERING
RIC-WIL INSULATED PIPE UNITS

- The Pre-sealed Unit for high efficiency.
- Structural strength of Armco Hel-Cor Conduit + Ric-wiL engineering throughout.
- Choice of grade and type of insulation—either bulk hand-packed or sectional pipe covering.
- A complete ready-assembled unit—nothing else to buy.

Write for Bulletin No. 4003

THE RIC-WIL COMPANY
Union Commerce Bldg.
CLEVELAND, OHIO
New York Chicago San Francisco
Agents in Principal Cities

for Underground or Outside Overhead Steam Lines

AIR CONDITIONING NOZZLES

Nozzles of unique Yarway Involute Design.

No internal parts or vanes to clog or erode.

Insure trouble-free air washing service.

Sizes and types for all requirements.

Many large users—installations total more than 5 million gallons per minute in water cooling and air conditioning service. Write for Bulletin N-615.

YARNALL-WARING COMPANY
104 MERMAID AVENUE
PHILADELPHIA

YARWAY

on the cooling water at Delta Star Electric and increased compressor efficiency.

This new Sarco cooling control is destined to save thousands of dollars for users of water-cooled engines and air compressors now operated with hand control, with the waste water going away at 60 to 85 degrees.

Compressor builders usually recommend 125 degrees, and this Sarco No. TR-40 holds it right there automatically. Compressor manufacturers, users and contractors—write for Catalog No. 197.

SARCO COMPANY, INC
183 Madison Avenue New York N.Y.
SEE PHONE BOOK FOR LOCAL SARCO REPRESENTATIVE

SARCO

Degree-Day Figures for March, 1940

HEATING & VENTILATING continues its twelfth year of publishing degree-day data for various large cities

	Albany, N. Y.	Atlanta, Ga.	Baltimore, Md.	Birmingham, Ala.	Boston, Mass.	Buffalo, N. Y.	Burlington, Vt.
Degree-days for March, 1940.....	1183	469	773	359	990	1177	1243
Degree-days, Sept. 1, '39 to Mar. 31, '40	6716	3346	4299	3027	5471	6162	7343
Degree-days, Sept. '38 to Mar. 31, '39.	6083	2366	3577	2071	4986	5574	6815
Degree-days, Sept. 1, to Mar. 31, Normal	5848	2758	4163	2283	5230	5800	6584

	Cheyenne, Wyo.	Chicago, Ill.	Cincinnati, Ohio	Cleveland, Ohio	Columbus, Ohio	Denver, Colo.	Des Moines, Iowa
Degree-days for March, 1940.....	840	1016	771	1056	849	687	975
Degree-days, Sept. 1, '39 to Mar. 31, '40	5746	5573	4910	5501	5179	4572	5898
Degree-days, Sept. '38 to Mar. 31, '39.	6169	5012	3998	4694	4336	4989	5294
Degree-days, Sept. 1, to Mar. 31, Normal	6174	5493	4345	5371	4891	5073	5825

	Detroit, Mich.	Dodge City, Kan.	Duluth, Minn.	El Paso, Tex.	Erie, Pa.	Evansville, Ind.	Fort Wayne, Ind.
Degree-days for March, 1940.....	1128	604	1376	208	1105	651	1021
Degree-days, Sept. 1, '39 to Mar. 31, '40	5944	4603	7503	2284	5740	4510	5817
Degree-days, Sept. '38 to Mar. 31, '39.	5410	4196	7883	2417	5009	3512	4979
Degree-days, Sept. 1, to Mar. 31, Normal	5691	4646	7911	2383	5407	3968	5321

	Fort Worth, Tex.	Grand Rapids, Mich.	Green Bay, Wis.	Harrisburg, Pa.	Hartford, Conn.	Indianapolis, Ind.	Ithaca, N. Y.
Degree-days for March, 1940.....	197	1118	1222	919	1044	839	1147
Degree-days, Sept. 1, '39 to Mar. 31, '40	2389	5825	6583	5129	5795	5146	6240
Degree-days, Sept. '38 to Mar. 31, '39.	2070	5299	6384	4502	5103	4283	5609
Degree-days, Sept. 1, to Mar. 31, Normal	2121	5827	6903	4880	5303	4855	5871

	Kansas City, Mo.	Knoxville, Tenn.	La Crosse, Wis.	Lansing, Mich.	Lincoln, Neb.	Little Rock, Ark.	Los Angeles, Calif.
Degree-days for March, 1940.....	697	554	1135	1173	852	396	133
Degree-days, Sept. 1, '39 to Mar. 31, '40	4907	3832	6441	6253	5625	3284	584
Degree-days, Sept. '38 to Mar. 31, '39.	4087	2977	6154	5742	4835	2576	1080
Degree-days, Sept. 1, to Mar. 31, Normal	4537	3460	6611	6237	5483	2733	1255

	Louisville, Ky.	Madison, Wis.	Memphis, Tenn.	Milwaukee, Wis.	Minneapolis, Minn.	Nashville, Tenn.	New Haven, Conn.
Degree-days for March, 1940.....	683	1189	420	1122	1264	548	988
Degree-days, Sept. 1, '39 to Mar. 31, '40	4556	6419	3428	5906	7071	3867	5390
Degree-days, Sept. '38 to Mar. 31, '39.	3575	5989	2529	5539	6908	2909	4779
Degree-days, Sept. 1, to Mar. 31, Normal	3916	6611	2854	6208	7044	3327	5129

	New Orleans, La.	New York, N. Y.	Norfolk, Va.	Oklahoma, City, Okla.	Omaha, Neb.	Peoria, Ill.	Philadelphia, Pa.
Degree-days for March, 1940.....	119	933	561	406	911	903	853
Degree-days, Sept. 1, '39 to Mar. 31, '40	1546	4960	3485	3502	5867	5569	4674
Degree-days, Sept. '38 to Mar. 31, '39.	968	4257	2542	3040	5125	4858	3975
Degree-days, Sept. 1, to Mar. 31, Normal	1024	4706	3104	3451	5633	5535	4385

	Pittsburgh, Pa.	Portland, Me.	Portland, Oreg.	Providence, R. I.	Reading, Pa.	Reno, Nev.	Richmond, Va.
Degree-days for March, 1940.....	909	1072	409	986	907	623	634
Degree-days, Sept. 1, '39 to Mar. 31, '40	5102	6188	2988	5462	5002	4010	4036
Degree-days, Sept. '38 to Mar. 31, '39.	4255	5827	3346	4880	4339	4587	3132
Degree-days, Sept. 1, to Mar. 31, Normal	4734	6002	3732	5206	4876	4902	3487

	Rochester, N. Y.	St. Louis, Mo.	Salt Lake City, Utah	San Francisco, Calif.	Scranton, Pa.	Seattle, Wash.	Spokane, Wash.
Degree-days for March, 1940.....	1165	672	567	236	1063	443	613
Degree-days, Sept. 1, '39 to Mar. 31, '40	6156	4631	4119	1572	5871	3005	4776
Degree-days, Sept. '38 to Mar. 31, '39.	5535	3711	4884	2019	5154	3503	5090
Degree-days, Sept. 1, to Mar. 31, Normal	5854	4309	4866	2123	5445	3931	5485

	Springfield, Ill.	Syracuse, N. Y.	Toledo, Ohio	Trenton, N. J.	Utica, N. Y.	Washington, D. C.	Wichita, Kan.
Degree-days for March, 1940.....	790	1169	1077	915	1242	753	593
Degree-days, Sept. 1, '39 to Mar. 31, '40	5148	6290	4852	5064	6834	4420	4476
Degree-days, Sept. '38 to Mar. 31, '39.	4352	5554	5091	4363	6133	3622	3863
Degree-days, Sept. 1, to Mar. 31, Normal	4951	5984	5372	4450	5955	4253	4421

Methods of applying the degree-day in connection with the operation of heating plants or for the prediction of fuel consumption of heating plants are described fully in the new enlarged edition of the DEGREE-DAY HANDBOOK, published by HEATING & VENTILATING, 148 Lafayette Street, New York, price $3. Degree-days as given above for a "normal" month or season are based on averages for a long period of years, ending about 1922. Averages covering different periods will disagree with the above figures slightly.

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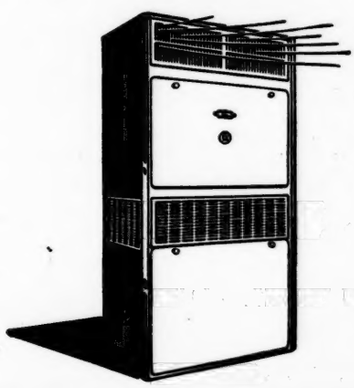
Unit Air Conditioners

and see why they are preferred by restaurants, stores, beauty parlors, offices, etc., everywhere.

Frick Unit Air Conditioners have extra capacity because each is equipped with water-cooled motor and machine space. Large slow-speed refrigerating machine is quieter, more dependable. Built in 3 and 5 hp. sizes.



Give your business the benefit of air conditioning: write for Bulletin 520 today.

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Frick Unit Air Conditioner

DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

EXTRA VALUE* AT NO EXTRA COST

Streamcooled

BALDOR MOTORS

* Baldor Streamcooled Motors are TOTALLY ENCLOSED, yet are offered at Standard *Open* Motor prices.

These motors are effectively fancooled, driving a constant stream of air over the entire exterior of the motor frame — an efficient, *non-clogging* cooling system.

Protected against dust, dirt, splash, flame, condensation and internal damage. Ball-bearing. Dynamically balanced.

THE MOTOR OF TOMORROW. Baldor Streamcooled Motors in redesigned and more compact N. E. M. A. dimension frames with 100 % glass insulation.

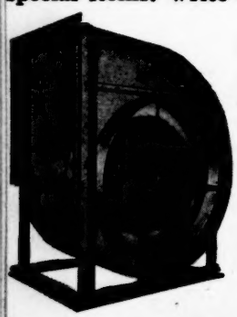
Many other features explained in BALDOR Bulletin No. 202. Ask for it.

BALDOR ELECTRIC COMPANY, ST. LOUIS
Representatives in Principal Cities

BALDOR
BETTER MOTORS

GET THE JOB DONE Economically with USAIRCO BLOWERS

USAIRCO blowers fit into every system and into every budget. There's a size and type for every need at a price that makes USAIRCO blowers the most profitable equipment on the market. They are the result of 16 years of progressive engineering and specialized manufacture. All USAIRCO air conditioning equipment is fully guaranteed as to ratings and performance. USAIRCO is equipped to give fast service on special items. Write for details.



HEAVY DUTY BLOWER

USAIRCO Heavy Duty Blowers for ventilation through any size duct systems. Capacities from 2,000 to 70,000 C.F.M. Available in double and single inlet. Over 5,000 in use in schools, public buildings, theatres.

HEAVY DUTY BLOWER
Type A

USAIRCO Type A. Heavy duty. Backwardly curved blade. Non-overloading power characteristic. Wide range of sizes and capacities.

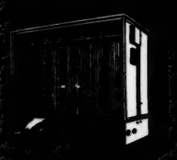
LIGHT DUTY BLOWER ASSEMBLY

USAIRCO Light Duty Blower Assembly. Also available in twin and triple assemblies. Capacities 800 C.F.M. to 4,000 C.F.M. Recommended for forced air furnaces and light duty air conditioning applications.

CO-OPERATIVE ENGINEERING SERVICE

Available to all factors in the industry are the services of USAIRCO's engineering staff, with a 16 year background in the successful design and application of air conditioning equipment for all types of work.

AIR WASHER



UNIT HEATER

UNIT HEATER BLOWER TYPE

HEAT CORE

UNIT COOLERS

SEND YOUR COMPLETE CATALOG

Name _____

Address _____

Town _____ State _____

UNITED STATES AIR CONDITIONING CORP.
Northwestern Terminal, Minneapolis, Minn.
Export: U. S. Air Conditioning International, Inc.
Graybar Bldg., New York

KNOW THE COMPANY AND THE LINE

COMING EVENTS

MAY 7-11. 44th annual meeting, National Fire Protection Association, Atlantic City, N. J. Headquarters at Chalfonte-Haddon Hall.

MAY 14-17. Annual meeting of the National District Heating Association; French Lick Springs Hotel, French Lick, Indiana. Further information available from John F. Collins, Jr., Secretary-Treasurer National District Heating Association, 1231 Grant Building, Pittsburgh, Pa.

MAY 20-22. Annual convention of Association of Gas Appliance and Equipment Manufacturers, at the French Lick Springs Hotel, French Lick, Ind.

MAY 21-24. 34th annual convention of the Smoke Convention Association at Hotel Statler, St. Louis.

MAY 27-29. 51st annual convention of the Heating, Piping and Air Conditioning Contractors National Association. To be held at the Hotel Pennsylvania, New York City.

JUNE 3-5. National Warm Air Heating and Air Conditioning Association, Mid-Year Meeting, Palmer House, Chicago. Managing Director, Allen W. Williams, 5 East Long Street, Columbus, Ohio.

JUNE 4-7. The 25th annual meeting of the American Association of Industrial Physicians and Surgeons together with the first annual meeting of the American Industrial Hygiene Association; Hotel Pennsylvania, New York City.

JUNE 6-7. Stoker Manufacturers Association at Hot Springs, Va.

JUNE 9-11. Summer meeting of the American Society of Refrigerating Engineers; Skytop, Pa.

JUNE 17-19. Summer meeting American Society of Heating and Ventilating Engineers; Washington, D. C.

OCTOBER 8-11. The 69th annual meeting of the American Public Health Association, Detroit. Book-Cadillac Hotel, Headquarters.

DECEMBER 2-7. 14th National Exposition of Power & Mechanical Engineering at the Grand Central Palace, New York, N. Y. For information write National Exposition Co., Grand Central Palace, New York, N. Y.

H&V'S PHOTOS

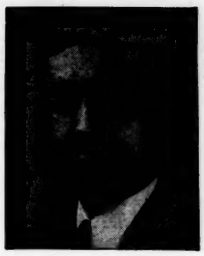
Page 19—Anthony Lord, architect, Asheville, N. C.
Page 21—Powers Regulator Co., Chicago, Ill.
Pages 29-32—Kraft Cheese Co., Chicago, Ill.
Pages 33-35—Hill & Knowlton, Cleveland, Ohio.
Page 46—The Dow Chemical Co., Midland, Mich.
Pages 47-49—Clifford Strock, Associate Editor, HEATING & VENTILATING.

WITH THE MANUFACTURERS

Bastian-Morley Co., Inc., LaPorte, Ind., announces that *L. T. Tegler* has been promoted to sales engineer.

Century Electric Co., St. Louis, Mo., announces a change of address of its district office in Chicago to Room 412, 600 W. Van Buren St. Telephone: Monroe 2600. *H. L. Madsen* is the district sales manager.

Fairbanks, Morse & Co., Chicago, has appointed *A. N. Thomas* sales manager of the Eastern District, Stoker Division. Mr. Thomas, with headquarters at Philadelphia, will be in charge of the Eastern section of the United States from the Western boundary of New York, Pennsylvania, West Virginia and Virginia. *A. F. Ludolph*, formerly Western district representative, has been called in to the Chicago office where he will be given special assignments.



E. R. Walker

Fedders Manufacturing Co., Buffalo, N. Y., has consolidated all heating and air conditioning equipment into the Air Conditioning Division with *E. R. Walker* as manager. Among the products of the Air Conditioning Division is the line of Type K heating coils recently announced.

Fedders Mfg. Co., Buffalo, N. Y., has completed a new plant equipped with highly developed automatic machinery for production of automotive radiators for original factory equipment on automobiles, trucks, tractors, buses and gasoline or Diesel driven industrial units, as well as heaters for cars, trucks and buses. This new plant is located at Owosso, Michigan, in the heart of the automotive industry. Together with the Buffalo factory, it more than doubles Fedders previous capacity.

W. B. Dobson

Oil City Tank and Boiler Company, Oil City, Pa., has appointed *W. B. Dobson* works manager. For many years Mr. Dobson was superintendent of the heating boiler division of the Struthers-Wells Titusville Corporation. Prior to this time he was associated with the Petroleum Iron Works Company, Sharon, Pa., in a similar capacity.

The Metal Stamping & Mfg. Co., Cleveland, Ohio, has changed its name, effective May 1, to *Morrison Products, Inc.* The company manufactures blowers, tool guards, pulleys and automobile replacement parts.

NEW TRADE LITERATURE

Exhaust Fans. A 16-page, standard size catalog, X 3659, illustrating and describing fans for commercial, industrial, and domestic applications. Gives information on method of installing fans, how to determine the correct sizes, and data on dimensions, performances and prices. THE EMERSON MFG. COMPANY, ST. LOUIS, MO.

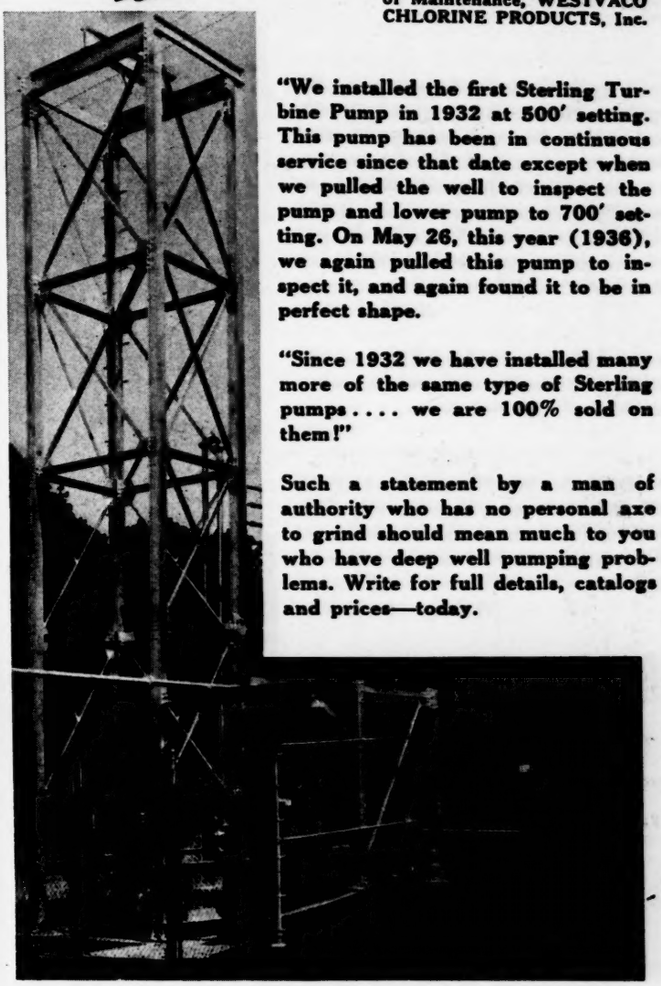
Expansion Joints. A 4-page, standard size bulletin, illustrating and describing the Yarway Gun-Pakt expansion joints. Also contains a list of representative users of Yarway expansion joints. YARNALL-WARING COMPANY, MERMAID LANE, PHILADELPHIA, PA.

Stokers. A 24-page standard size bulletin No. 600, illustrating and describing the Detroit line of Uni-Stokers. Gives information on construction, outstanding features, method of regulation and application to various types of boilers. Also contains a large number of photographs showing typical installations. DETROIT STOKER COMPANY, GENERAL MOTORS BUILDING, DETROIT, MICH.

Unit Heaters. A 12-page standard size catalog No. 105 on the Comet Air Stream unit heaters. This catalog is made up principally of capacity tables and physical data but also includes information on boiler selection, pipe sizes, and piping connections. THE NEW YORK BLOWER COMPANY, 32ND STREET AND SHIELDS AVENUE, CHICAGO, ILL.

"INSTALLED IN 1932, This STERLING Turbine Pump IN PERFECT CONDITION TODAY!"

— Read this Excerpt from a Letter of J. L. Biddle, Supt. of Maintenance, WESTVACO CHLORINE PRODUCTS, Inc.



"We installed the first Sterling Turbine Pump in 1932 at 500' setting. This pump has been in continuous service since that date except when we pulled the well to inspect the pump and lower pump to 700' setting. On May 26, this year (1936), we again pulled this pump to inspect it, and again found it to be in perfect shape.

"Since 1932 we have installed many more of the same type of Sterling pumps .... we are 100% sold on them!"

Such a statement by a man of authority who has no personal axe to grind should mean much to you who have deep well pumping problems. Write for full details, catalogs and prices—today.

Few Sterling pump owners need service — but if you need it, Sterling offers the highest class of service from coast to coast.

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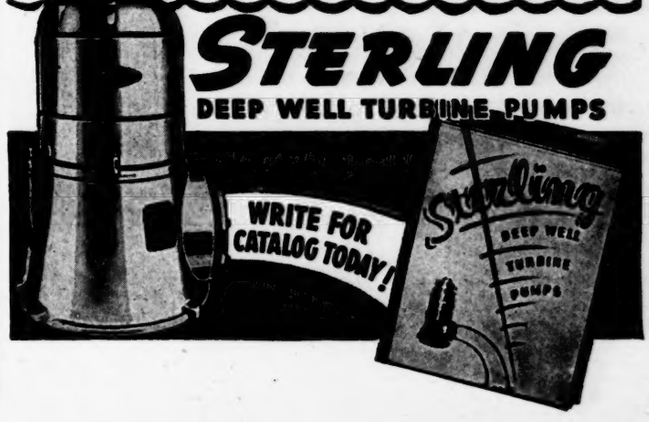
STERLING PUMP CORP.

Hamilton, Ohio Stockton, Calif.



YARWAY GUN-PAKT EXPANSION JOINT

It is packed under full steam pressure. By the turn of a wrench, integral pressure guns force a special semi-plastic packing into the stuffing box.

Welded Steel Construction. Alemite lubricated cylinder-guided sleeve. Made also in conventional gland-pakt types. Write for Bulletin EJ-1907.

YARNALL-WARING COMPANY
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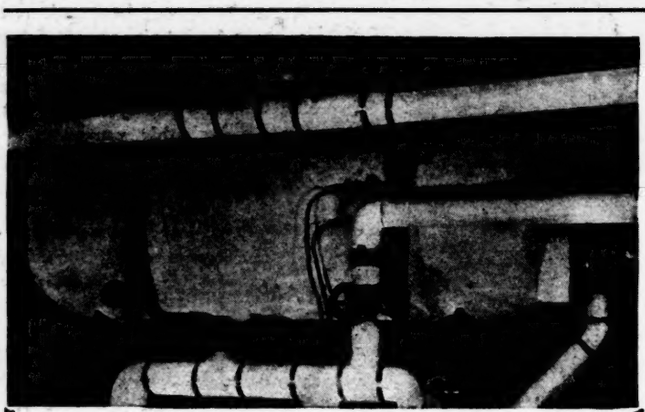
One of 40 - 24" Yarway Gun-Pakt Expansion Joints recently purchased by a leading automobile manufacturer. Good for 300 lbs. pressure, with welding ends and welded steel base.



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These Patterson Storage Heaters are practically ever-lasting because they won't rust. No rust also means no red water.

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Make the first cost the last cost!

Where Somers Hair Spun Glass Filters are installed as original or replacement equipment there's an end to the cost. Somers Filters are washable, odorless, non-absorptive, do not rot, and are practically indestructible.

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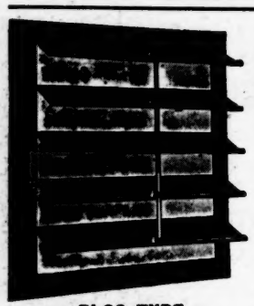

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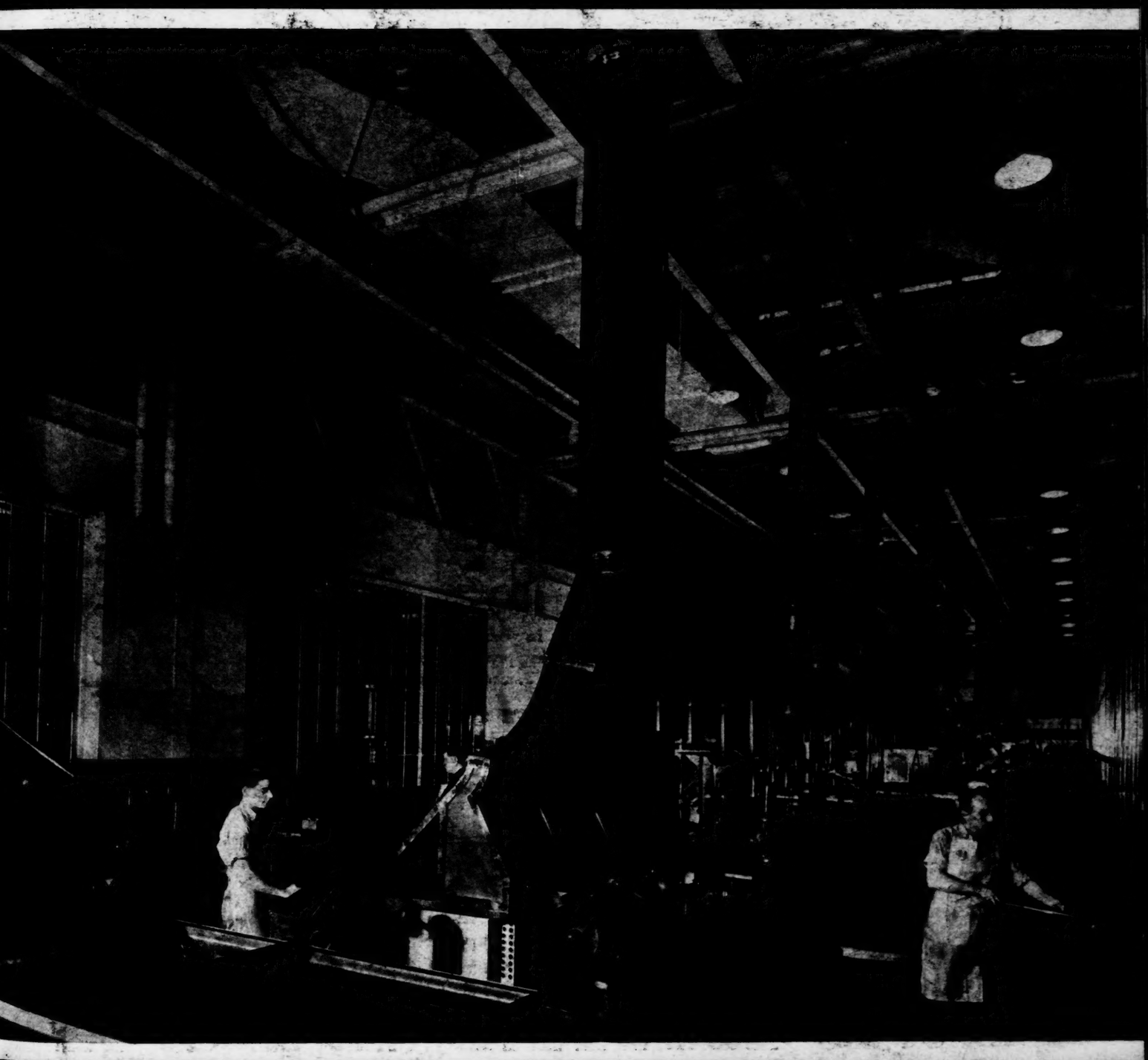
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